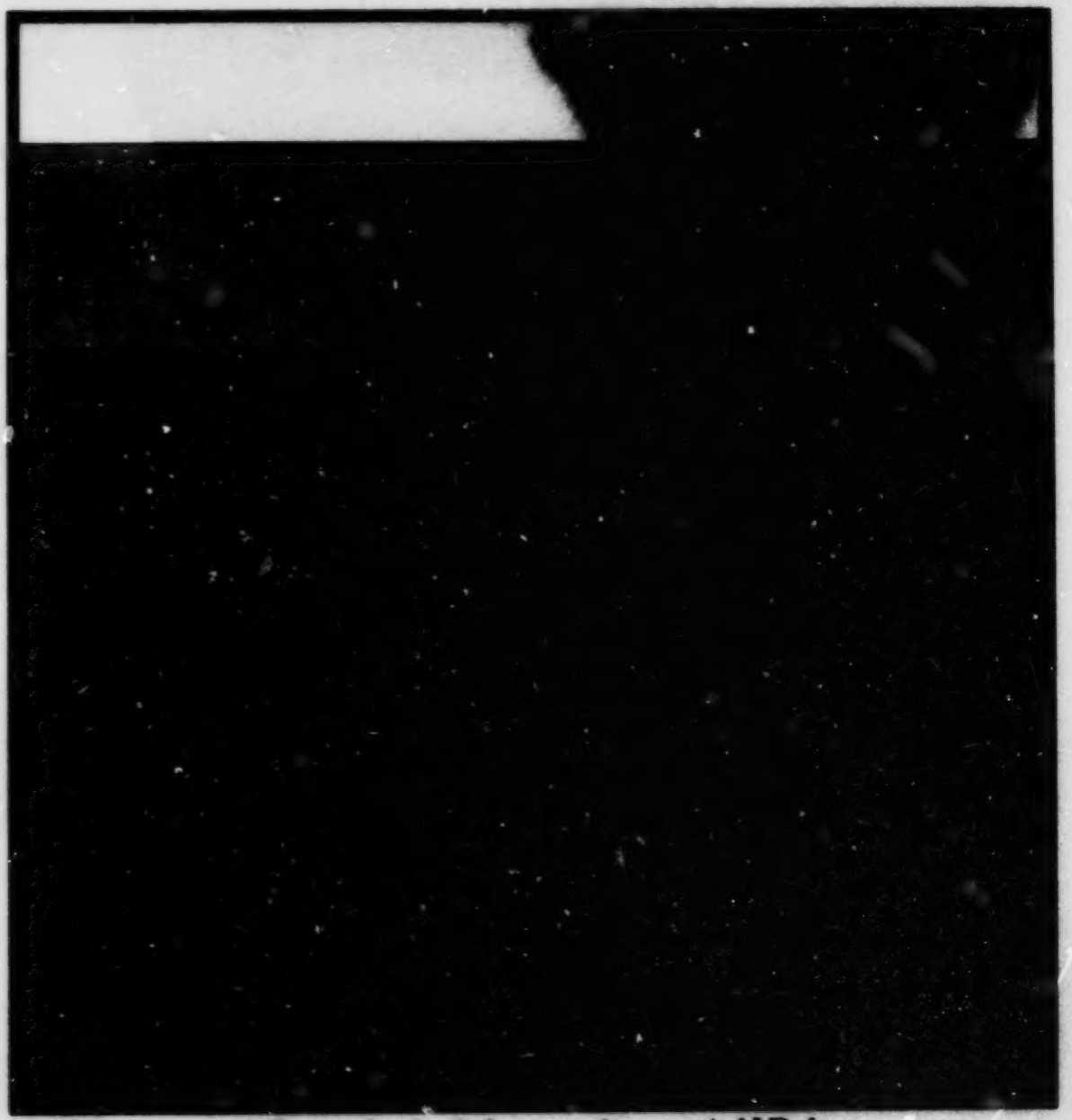
TIME LOST

A Demand for Action on Acid Rain



A Report by the Sub-committee on Acid Rain

HOUSE OF COMMONS
CANADA

84- 5083

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CANADA

TIME LOST

**Report of the
Sub-Committee on Acid Rain
of the Standing Committee on
Fisheries and Forestry**

NOTE: This report constitutes Issue No. 5 of the Minutes of Proceedings and Evidence of the Sub-committee on Acid Rain of the Standing Committee on Fisheries and Forestry, Second Session, Thirty-second Parliament, 1983-84.

Additional copies of this report are available from the Clerk of the Sub-committee at the following address:

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RECOMMENDATIONS

1 Motor Vehicle Emission Standards

The Sub-committee recommends that the emission standards in Canada for nitrogen oxides (NO_x) be changed from 3.1 grams per vehicle mile to 1.0 gvm; for hydrocarbons (HC) from 2.0 gvm to 0.41 gvm; and for carbon monoxide (CO) from 25.0 gvm to 7.0 gvm. (p. 17)

2

The Sub-committee recommends that the new emission control standards should be required for the 1986 model year. (p. 17)

3 Lead in Gasoline

The Sub-committee recommends that lead be gradually phased out as a gasoline additive and that leaded gasoline be banned in Canada by 1995. (p. 17)

4 Heavy-Duty Vehicles

The Sub-committee recommends that Transport Canada consult fully with the United States Environmental Protection Agency to ensure that Canadian and American emission standards for heavy-duty vehicles are compatible. (p. 17)

5 Motor Vehicle Emission Standards

The Sub-committee recommends that legislative authority to regulate motor vehicle emissions through standards applicable to manufacturers and distributors be transferred from the *Motor Vehicle Safety Act* to the *Clean Air Act* and hence from the Ministry of Transport to the Department of Environment which already has significant responsibilities in the area of air pollution. (p. 18)

6 Scientific Research

The Sub-committee recommends that Regulation 2900 of the *Income Tax Act* be re-written to permit commercial-scale testing as a qualifying expenditure for the purposes of computing the scientific research deduction and the additional allowance for scientific research. These changes are to apply to expenditures incurred after 31 December 1979. (p. 29)

7 Accelerated Capital Cost Allowances

The Sub-committee recommends that equipment used in the abatement of SO_2 and NO_x emissions be eligible for a 100% write-off in the year in which the capital expenditures are made. (p. 29)

8

The Sub-committee recommends that equipment used in the control of acid gas emissions be eligible for an additional capital cost allowance equal to 10% of the expenditures on such equipment. This allowance is to be made available in the year in which the expenditures are incurred and is limited to properties purchased by 31 December 1994. (p. 29)

9

The Sub-committee recommends that, upon approval by the Minister of the Environment, the one-year capital write-off should apply to *all* properties which effect a significant reduction in acid gas emissions, whether or not the capital expenditure is primarily environment-related. (p. 30)

10 **Carry-Back Provisions**

The Sub-committee recommends that the *Income Tax Act* be amended to increase loss carry-back provisions to 7 years for all losses. (p. 31)

11 **Tax Credit Financing**

The Sub-committee recommends that the Departments of Finance and Environment consider the feasibility of allowing investors to take deductions for pollution-control expenditures incurred by firms in the non-ferrous smelting sector. (p. 31)

12 **Direct Abatement Grants**

The Sub-committee recommends that the Federal Government provide assistance to the non-ferrous smelting industry through a system of one-time *taxable* grants for capital expenditures associated with SO_2 abatement. (p. 34)

13

The Sub-committee recommends that these funds be made available only for retrofitted operations which have reduced their emissions by 31 December 1994 or have commenced retrofit construction by that date. (p. 34)

14

The Sub-committee recommends that the following formula be used to allocate these grants:

1) a basic grant of $350 for every tonne per year (tpy) of SO_2 reduction from actual 1980 emission levels;
2) an additional grant of $100 for every tonne per year of SO_2 reduction from actual 1980 levels in excess of a 50% reduction.

These per unit grants are to be adjusted according to changes in the Gross National Expenditure Implicit Price Index for machinery and equipment in order to maintain the purchasing power of these grants. (p. 34)

15

The Sub-committee recommends that these funds be disbursed on a dollar-for-dollar basis as construction expenditures are undertaken. Disbursements are to be made on the basis of estimated SO_2 reductions from 100% of rated capacity utilization. (p. 34)

16 **Qualifying Expenditures**

The Sub-committee recommends that qualifying expenditures for capital cost allowances and the investment tax credit not be reduced by amounts received under the SO_2 abatement grant system. (p. 35)

PREFACE

The Sub-committee on Acid Rain of the Standing Committee on Fisheries and Forestry was first formed on 18 July 1980. The Sub-committee subsequently conducted a detailed investigation of acidic precipitation until October 1981 when the report, STILL WATERS, was released. We felt that we had considered in some depth all important aspects of the acid rain problem. Thirty-eight recommendations were presented to government in STILL WATERS.

We believed then, and we continue to believe, that the adoption of our recommendations on major pollutant sources - even in part - would have enabled Canada to reduce significantly its contribution to the acid rain phenomenon in North America. In late 1981 we also believed that an effective agreement between Canada and the United States on a joint strategy to control acid rain would soon be achieved.

By late 1982, the former Sub-committee members were aware that negotiations between the Canadian and United States governments had reached an impasse. Moreover, it was becoming increasingly apparent that little or no progress was being made in Canada toward achieving significant reductions in domestic SO_2 and NO_x emissions. The former members of the Sub-committee agreed unanimously to request a new Order of Reference from the House of Commons through the Standing Committee on Fisheries and Forestry.

On 9 March 1983, the Standing Committee received a new Order of Reference from the House of Commons empowering it to appoint "nine members of the House to act as a subcommittee to investigate, monitor and report on all aspects of acid rain". With the termination of the First Session of the Thirty-second Parliament in December 1983, it became necessary for the Sub-committee to request a new Order of Reference. This was granted on 13 December 1983.

Over the past fifteen months, the Sub-committee, both as a group and as individuals, has travelled extensively in Canada and the United States. In May 1983, the Sub-committee visited Sudbury for discussions with Inco officials. In June 1983, public hearings were held in Ottawa; that month also, the Sub-committee travelled to Washington, D.C. for discussions with U.S. government officials and members of the United States Congress. Additional public hearings have been held in Vancouver, Regina, Toronto, Quebec City, St. John's and again in Ottawa.

The Sub-committee travelled to Manitoba in February 1984 for discussions with officials of Hudson Bay Mining and Smelting Company, Inco Metals Company, and the United Steelworkers of America in Flin Flon and Thompson. In Winnipeg, the Sub-committee met with the provincial Minister of Environment and senior departmental officials. In May, 1984, the Sub-committee journeyed to Knoxville, Tennessee for a series of meetings with officers of the Tennessee Valley Authority to discuss emissions control in the thermal generation of electric power.

Throughout our investigation, the members of the Sub-committee put aside political differences and tackled the acid rain issue with a common resolve. As Chairman, I want to thank personally the many Sub-committee members who have worked tirelessly since 1980 to seek a solution to this most serious environmental problem.

On behalf of the Sub-committee I want to express our sincere gratitude to our support staff. The Clerk of the Sub-committee, Jean Michel Roy, is commended for carrying out the many difficult duties associated with committee work.

I wish to accord special acknowledgement to the Sub-committee's research staff from the Research Branch of the Library of Parliament. Dr. Thomas Curren and Mr. Marion G. Wrobel worked with the Sub-committee under our original Order of Reference and were in large measure responsible for our highly-acclaimed first report, STILL WATERS. They have continued their exemplary service to the Sub-committee and have again made a major contribution to this present report.

The Sub-committee presents this Final Report on acid rain in the hope that governments and industries will henceforth work cooperatively to safeguard our common environmental heritage, a sentiment cogently expressed by Alden Whitman:

> *Our ideals, laws and customs should be based on the proposition that each generation in turn becomes the custodian rather than the absolute owner of our resources - and each generation has the obligation to pass this inheritance on to the future.*

Ronald Irwin, M.P.
Chairman

INTRODUCTION

The debate over acid rain involves many important sectors of society in North America, and in most industrialized nations. The most important aspects of the issue are the scientific, economic, political, and diplomatic.

The basic scientific debate is, in the opinion of the Sub-committee, all but over. While there is a definite need for more research to hone the fine edge of our understanding of the myriad complexities of acid rain, there is little disagreement among reputable scientists that the acid rain threat is real and that the emission of the precursor pollutants, the oxides of sulphur (SO_2) and nitrogen (NO_x), must be significantly curtailed. The Sub-committee emphatically rejects the proposition that more research is necessary before emission control programs can be adopted. With more than 3,000 scientific studies published on this subject, we maintain that an adequate data base for positive action already exists.

There is heated debate on the costs of acid rain controls and the eventual allocation of these costs. The Sub-committee has, from the outset, been aware that effective controls will be expensive and difficult to implement, both in terms of direct dollar expenditures and in the eventual redistribution of employment opportunities in affected sectors of the North American economy. We believe that the first principle to be recognized in any consideration of the economics of acid rain is that the costs of doing nothing, and allowing our environment to suffer massive and possibly irreparable harm, immeasureably exceed the costs of prudent controls.

Once this principle is accepted, as it must be, governments can turn their attention to the difficult question of cost allocation. The Sub-committee has received testimony on a variety of methods and programs to pay the costs of acid rain control. These cover the entire spectrum from the "polluter-pay principle", which mandates that the polluting industry must shoulder the entire financial burden of clean-up, to the proposal that governments should provide all funding for controls.

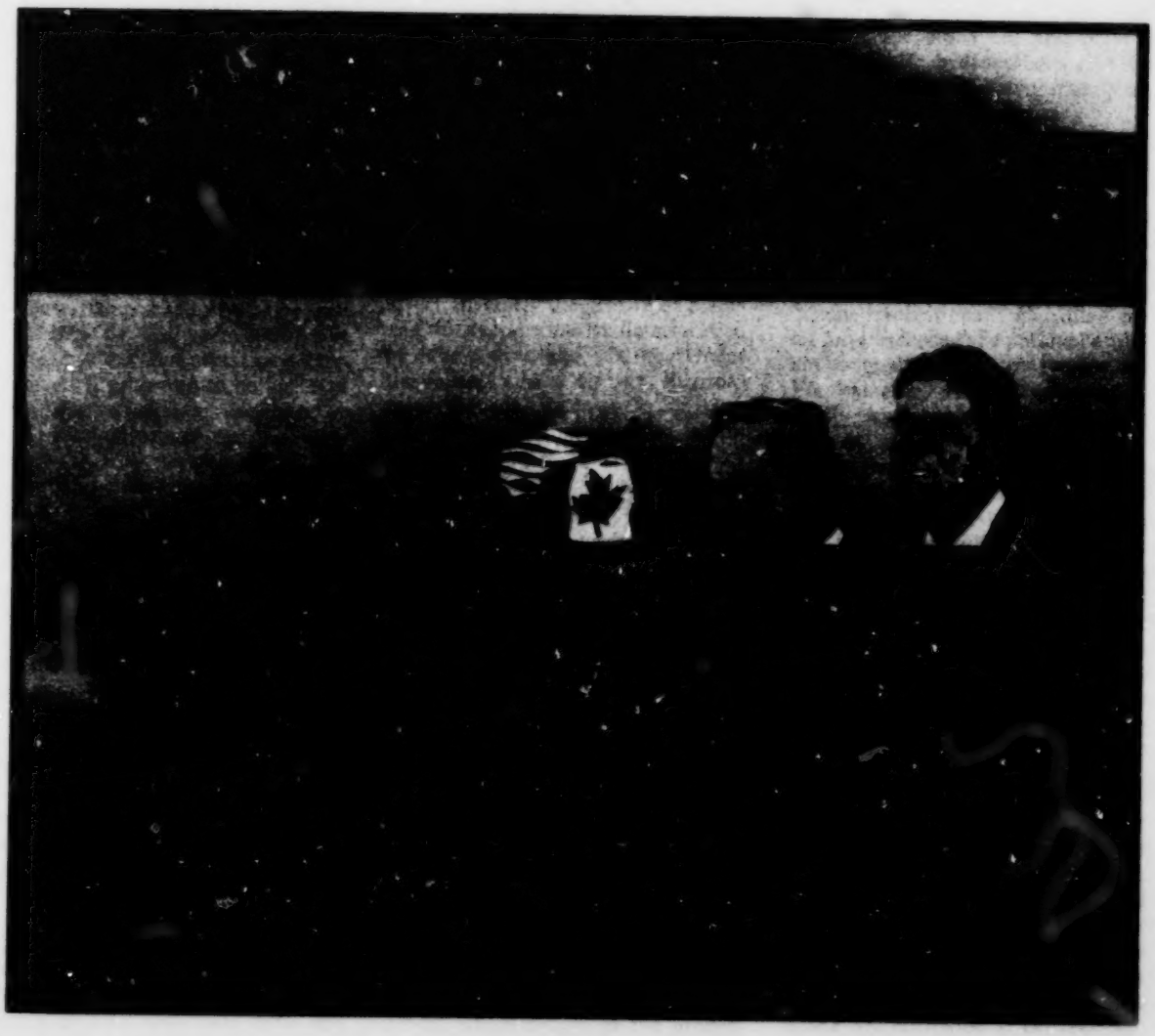
The scientific and economic debates inevitably have fuelled the political and diplomatic arguments over acid rain abatement. Because at least one-half of the acidic precipitation falling on Canada has its source in the United States, and because our country has so much to lose from the unabated onslaught of acidic pollution, our Federal Government, with the support of provincial administrations, has for some years been attempting to reach an agreement with the United States Government on acid rain control. The failure of this initiative, due principally to the intransigence of the Reagan Administration, has been a bitter setback for all Canadians.

In STILL WATERS we stated that acid rain control depended upon an exercise of political will. We still believe this to be true. It is quite clear that the majority of our American colleagues lack the political will to tackle the problem; indeed, it has been argued by some that the essential problem with the Reagan Administration, and with certain members of Congress of both parties, is an overabundance of political will to resist any rational argument in favour of transboundary atmospheric pollution controls.

Until very recently, our own governments, federal and some provincial, had not followed a policy conducive to winning many converts among potential allies in the United States. In a number of important areas, including non-ferrous smelters, motor vehicles, and coal-fired power plants, the quantities of domestic SO_2 and NO_x emissions remain much too high. For those Canadians, including members of this Sub-committee, who have travelled to the United States to argue for more stringent controls on American polluters, Canadian government inaction and/or obstinacy with respect to domestic controls have been, quite frankly, an embarrassment.

The Sub-committee applauds the recent announcement by the Minister of Environment Canada and his provincial counterparts that a unilateral 50% reduction in domestic SO_2 emissions will be effected east of the Saskatchewan-Manitoba border by 1994. The Sub-commmittee has been advocating precisely such an initiative for some considerable time. The Sub-committee urges that this policy be speedily translated into a dynamic strategy for the control of domestic acid rain pollution.

NO_x EMISSIONS FROM MOTOR VEHICLES



In 1980, anthropogenic nitrogen oxides (NO_x) emissions in North America totalled 21.3 million tonnes; about 1.74 million tonnes came from Canadian sources. In Canada, the transportation sector accounts for 1.07 million tonnes, about 62% of the national total. Power plants produce about 13% of total NO_x, and other sources 25%. Approximately one-third of the transportation total, or 21% of all man-made NO_x emissions, comes from automobiles (in official terms, "light-duty vehicles").

In eastern Canada, where the most sensitive ecosystems are located, total NO_x emissions are about 946,000 tonnes. Here, light-duty vehicles account for 24.7% of the total and other transportation vehicles about 37.1%

In the absence of more stringent regulatory controls, total NO_x emissions in Canada are projected to increase, from 1980 levels, by just over 30% by the year 2000. The increase in the transportation sector, however, is projected to be just over 50%. The Canadian Coalition on Acid Rain informed the Sub-committee that a tightening of the Canadian emissions standard for light-duty vehicles to one gram per vehicle mile from the present 3.1 gram standard would reduce the projected increase by the year 2000 to about 9%.

For all practical purposes, nitrogen oxides may be considered to be the sum of two individual gases, nitric oxide (NO) and nitrogen dioxide (NO_2). NO_2 forms only 5% to 10% by volume of total NO_x from combustion sources. It is, however, formed in the atmosphere by a reaction between ozone (O_3) and nitric oxide.

Dr. Robert Slater, Assistant Deputy Minister of Environment Canada's Environmental Protection Service, testifed before the Sub-committee on the environmental effects of NO_x pollutants. NO_x can exert three different kinds of environmental effect. First, NO_x is a direct pollutant; second, NO_x can produce indirect pollutant effects by acting in combination with other pollutants to produce ozone and photochemical smog; and third, NO_x from all sources, including motor vehicles, contributes to Canada's acid rain problem.

A. Pollutant Effects

Nitrogen oxides, as direct pollutants, are a matter of concern in urban areas and, at high concentrations, can adversely affect human health by damaging respiratory tissues. Also, they have the potential to affect adversely the growth of plants and to accelerate the deterioration of fabric dyes and textiles. Under the federal *Clean Air Act*, Environment Canada, in co-operation with provincial governments, has established national ambient air quality objectives for nitrogen dioxide (NO_2).

These objectives were discussed in STILL WATERS in considerable detail. Three levels of objectives have been defined: tolerable, acceptable, and desirable. They are enforceable by the provinces if adopted by them under provincial laws. Dr. Slater informed the Sub-committee "that nitrogen dioxide levels are now at or below acceptable levels in Canadian cities. So the conclusion of that is that with respect to the direct effects of nitrogen dioxide as a pollutant there is really not a major concern in Canada".

The second class of pollutant effect of nitrogen oxides is much more significant. This indirect effect, which results in the production of photochemical smog, occurs when NO_x reacts in sunlight with another group of pollutants known as "hydrocarbons".

Hydrocarbons are emitted in automobile exhaust gas and comprise a complex mixture of chemicals. Included in the mix are such low-molecular-weight hydrocarbons as methane, ethane and ethylene which are present in gasoline itself. The mixture may also contain benzene, a chemical which can exert direct adverse health effects. Other components of the hydrocarbon mixture also have direct health concerns and include aldehydes and polycyclic aromatic hydrocarbons (PAH). PAHs have well-known mutagenic and carcinogenic properties.

A major component of photochemical smog is ozone (O_3), a gas which has detrimental effects on human health, vegetation (including valuable agricultural crops), and on man-made materials. Dr. Slater informed the Sub-committee that "ozone levels in many Canadian cities have exceeded the national ambient air quality objectives for ozone". For example, ozone levels significantly higher than normal occur once or twice a week in Vancouver during the summer, a worrisome situation which was also brought to the Sub-committee's attention during our Vancouver public hearing. The Vancouver ozone pollution comes primarily from gasoline-powered cars and light-duty trucks in the Vancouver urban area itself, a situation reflected in other large Canadian cities. However, the high ozone levels in eastern Canada generally, and in southwestern Ontario in particular, are related to transboundary air pollution movement.

The annual commercial value of crops in eastern Canada which are sensitive to ozone, including corn, potatoes, soybeans, tomatoes, and lettuce, is $2 billion. Dr. Slater stated to the Sub-committee that the average annual losses in crop yields associated with ozone, in Ontario alone, are estimated at between $20 million and $50 million. The Sub-

committee is also aware that ozone is considered to be a threat to forests, particularly in West Germany which has suffered massive tree damage in the past decade.

The third aspect of NO_x pollution, and the one of principal interest to this Sub-committee, is the relationship between nitrogen oxides and acid rain. While the major precursor pollutant of acid rain is sulphur dioxide, NO_x emissions account for about 35% of Canada's acid rain in the summer months and as much as 50% during the winter when sulphate levels in our environment are reduced.

The Sub-committee is fully aware that the nitrate component of acid rain is, in some cases, less of a problem than the sulphate portion. Indeed, the deposition of nitrate on terrestrial regions provides a needed plant nutrient and, in the warm summer months, the deposition of nitrate in freshwater lakes may actually raise the pH of the surface water through a series of reactions in the ecosystem.

These facts notwithstanding, the nitrate component of acid rain is a matter of considerable concern in other areas, particularly in the snowpack which accumulates during the winter months when the sulphate: nitrate ratio of precipitation is decreased. Research carried out by Noranda Mines Limited in northwest Quebec over a six-year period has shown that the relative contribution of nitrates to snow acidity in some areas varies from 43% to 73% with an average of about 60%.

When the snowpack melts in the spring, the accumulated acids from both sulphates and nitrates flow into rivers and lakes. This surge of acidity is known as "spring shock" and, because it occurs at the most critical stage in the life cycle of many aquatic species, can kill fish eggs and fry (newly-hatched fish). This highly acidic water may also damage ecosystems by killing the eggs of amphibians such as frogs and salamanders laid in spring melt pools.

B. Emission Control Standards

Under the *Motor Vehicle Safety Act* administered by Transport Canada, there are standards for emissions of nitrogen oxides (NO_x), hydrocarbons (HC), and carbon monoxide (CO). In the United States these three pollutants are regulated under the *Clean Air Act* which is administered by the Environmental Protection Agency (EPA). In the state of California, the NO_x emissions from motor vehicles are even more strictly regulated than in the other 49 states. A comparison of emission standards is shown in Table A.

The United States standards have been in place since 1981. By comparison, the Canadian standards are extremely lax. For reasons that are frankly incomprehensible to this Sub-committee, Canada permits emissions of NO_x, HC, and CO that are more than three-, four-, and seven-times greater, respectively, than those permitted in the United States.

In 1981, the Sub-committee stated that it was "appalled that motor vehicles in Canada emit three times as much NO_x per vehicle mile as vehicles in the United States". In STILL WATERS we made two recommendations to the Federal Government to rectify this situation.

The first recommendation stated that NO_x emission control standards in Canada should be made at least as stringent as those in the United States. The second recommended that legislative authority for automobile emissions should be transferred from the *Motor Vehicle Safety Act* to the *Clean Air Act*, and hence from Transport Canada to Environment Canada.

Neither of these recommendations has been adopted by the Federal Government.

In September 1982, Environment Canada published a notice of intent to prepare a Social and Economic Impact Analysis (SEIA) of more stringent light-duty motor vehicle emission standards for hydrocarbons, carbon monoxide, and nitrogen oxides. This notice superceded an earlier notice of 20 February 1982 regarding the preparation of a SEIA for NO_x only. The proposed emission standards are as follows: NO_x 1.0 gvm, HC 0.41 gvm, and CO 7.0 gvm. The proposed NO_x and HC standards are identical to U.S.

Table A — Motor Vehicle Emission Standards in Canada, the United States and California

standards; the proposed CO standard is equivalent to the 1980 U.S. standard (and the present California standard) and about twice the level of 3.4 gvm currently permitted in the United States.

The SEIA involves the preparation of eight studies for the Department of the Environment on a range of topics: the effects of automotive emissions, air quality trends, technologies and costs, a comparison of U.S. and Canadian car prices, automobile fuel consumption, the contribution of the automobile to Canada's oxidants problem, nitrates and lake acidification, and automobile NO_x contribution to acid rain. The SEIA was scheduled to be completed, and a final decision made on the proposed emission standards, by August 1983. The new emission standards, if adopted, were to become effective on 1 January 1986.

The SEIA still has not been completed at the time of this writing. (However, four of the contracted studies were tabled with the Subcommittee at the Toronto public hearing on 8 March 1984). The possibility exists that the new emission standards, if adopted, might not be in place until the 1987 model year. Evidence presented by the Canadian Coalition on Acid Rain at the Toronto hearing shows that Environment Canada has been deliberating the imposition of more stringent emission standards at least since October 1981. Considering that the United States has had its more stringent standards in place since 1981, the Sub-committee is of the opinion that something is horribly amiss in the Canadian government's environmental review process.

Testimony presented to the Subcommittee by representatives of the automobile industry disputed the need for reduced emissions of motor vehicle NO_x. Their objections can be placed in three categories. First, the industry representatives argued that motor vehicle NO_x emissions contribute little to acid rain and imposition of the one-gram standard will yield little beneficial effect. Second, a reduction of NO_x emissions will acutally cause an *increase* in ozone in urban areas and is, therefore, a counterproductive action. Third, adoption of the three-way catalytic converter technology (similar to that presently required by law in the United States) will not yield benefits proportional to the high costs involved.

The Sub-committee has considered carefully this testimony together with that provided by other witnesses, and we present our conclusions below.

With regard to the contribution of automobile-sourced NO_x to acid rain, the Sub-committee feels that all sources of precipitation acidity should be controlled where this is economically and technologically feasible. We concur with the testimony of Environment Canada that motor vehicle NO_x emissions are a cause of concern in the acid rain equation.

Moreover, we share the concern expressed by Environment Canada and other witnesses that total NO_x emissions will increase significantly by the end of the century if more stringent controls are not adopted and that a disproportionate share of this increase will come from the transportation sector. If the control of motor vehicle NO_x involved the development of radically new and unproven technology, there might be some merit to the arguments of the automobile industry. But the technology is available and proven and already in use on the great majority of automobiles sold in North America.

The present Canadian regulatory position is therefore an anomaly, is environmentally harmful, and causes acute political embarrassment to Canadians in discussions with U.S. legislators and officials on the need for continental controls on acid rain.

The Sub-committee received conflicting testimony on the effects that NO_x reductions will have on ozone production in the lower troposphere. As was noted earlier, ozone is not a primary pollutant but a product of reactions between nitrogen oxides and hydrocarbons catalyzed by sunlight. Witnesses from the automobile industry argued that a decrease in NO_x emissions could result in an increase in ozone concentrations and we accept the fact that there is some scientific evidence to support this view.

Mr. Michael P. Walsh, former Deputy Assistant Administrator for Mobile Source Air Pollution Control with the U.S. Environmental Protection Agency and now a private engineering consultant, testified to the Sub-committee that the control of photochemical smog and ozone requires a reduction in *both* hydrocarbon and NO_x pollutants. A reduction in emissions of NO_x alone might well result in an increase in ozone pollution, particularly in urban areas. This conclusion is also shared by officials at Environment Canada.

We do not deny that this is an area of considerable controversy within the scientific community and one which will only be resolved by additional research. For the present, however, the Sub-committee takes the view that both NO_x and hydrocarbon emissions should be reduced. We believe that this will produce tangible benefits for acid rain control and may well reduce the photochemical smog and ozone pollution in our large cities and decrease the threat that elevated ozone levels pose for our forests and agricultural crops.

Adoption of the three-way catalytic converter to effect reduced emissions of NO_x, hydrocarbons and carbon monoxide will bring an additonal benefit to Canadians. Since cars equipped with these converters must be fuelled with lead-free gasoline, the proliferation of such vehi-

cles will significantly and progressively reduce the burden of lead pollution in the Canadian environment. There is extensive and compelling evidence that lead is a potent health hazard for humans. The threat is greatest for children in urban areas, especially those less than three years old, who are vulnerable to irreversible brain damage from this toxicant.

Dr. Slater stated that, since 1975, the demand for lead-free gas in Canada has grown to about 45% of all gas sold. Environment Canada has calculated that, with stricter emission control standards, the demand for lead-free gasoline could grow by an additional 4% per year.

On 16 May 1984, Environment Canada promulgated new regulations to reduce the lead content of gasoline. The regulations will become effective on 1 January 1987 and will reduce the lead content from 0.77 grams per litre (g/l) to 0.29 g/l, effecting an almost 80% reduction in automobile lead emmissions from 1972 levels.

The oil-refining industry views the adoption of three-way catalytic convertors as leading to the eventual elimination of leaded gasoline in Canada. Although there may be substantial dollar costs involved in such an eventuality, the Sub-committee considers this, on balance, to be a positive development.

C. Costs and Benefits

The question of costs and benefits of any regulatory action is invariably difficult and controversial. Groups who are opposed to regulation can, with impressive speed, develop cost estimates which are usually, at first sight, alarming. Unfortunately, it is almost always difficult to produce good dollar estimates of the benefits to be derived from pollution control. Since the most effective and intelligent pollution-control measures have to be installed *before* serious damage is inflicted upon ourselves and our environment, the decisions are almost always controversial. This theme has been replayed endlessly throughout the Sub-committee's involvement in the acid-rain debate.

The situation with respect to automotive NO_x emissions is no different, as witness the fact that representatives of the automobile industry who appeared before us in Toronto were absolutely opposed to the adoption of more stringent emissions standards. The principal objection was based on cost. Testimony presented by the Motor Vehicle Manufacturers' Association (MVMA) states that the "incremental price increase to the Canadian buyer for (the three-way, closed-loop reduction catalyst system) would probably be between $200 to $400 per vehicle". The MVMA estimated a miniumum annual expenditure by Canadian motorists of $200 million, based on sales of approximately one million automobiles in Canada each year.

The Sub-committee received evidence that the weighted average of NO_x emissions for all automobiles in Canada is about 1.8 grams per mile, considerably below the 3.1 gram standard. Many cars sold in Canada, therefore, are already equipped with an emission-control system. Thus, for many new cars, the move to more stringent controls is a matter of upgrading rather than starting from scratch.

The SEIA study on the costs of automobile emissions reduction, submitted to the Sub-committee at the Toronto hearing, provides a "best estimate" of the incremental cost impact to the consumer of $200 where the currently used oxidation catalyst system is upgraded to the American closed-loop three-way reduction catalyst system, and about $400 for upgrading a vehicle with a non-catalyst system to a three-way system.

Dr. Robert Slater of Environment Canada stated to the Sub-committee that a correlation of the SEIA study with another study by a U.S. consultant produces an incremental unit cost of about $150 per automobile. This figure is about 1.5% of the price of an average new vehicle or, looked at in another way, the price of a set of luxury hubcaps.

In summary, we present a comprehensive estimate of costs as calculated by the petroleum industry. In April 1983, the Petroleum Association for Conservation of the Canadian Environment (PACE) presented a brief to Environment Canada on proposed emission standards for light duty motor vehicles. PACE estimated that total costs of a 1.0 gvm NO_x standard would exceed $900 million annually by 1990. (All figures are in constant 1983 dollars.) This total includes: $250 million equipment costs; $215 million inspection and maintenance costs; a $140 million fuel economy penalty; and $315 million in added refinery costs.

PACE's estimate of equipment costs is $50 million more than the MVMA estimate and $100 million more than the figure quoted by Dr. Slater. On the basis of evidence cited elsewhere in this chapter, we reject this estimate of the fuel economy penalty and the inspection and maintenance costs. Thus we feel that the PACE figures overestimate total costs by approximately 100%.

The Sub-committee recognizes that the total elimination of lead as a gasoline additive can increase refining costs by more than the $315 million mentioned above. However, these costs cannot be examined in isolation; they must be viewed in the context of expected benefits.

A recent study by the United States EPA indicates that the total elimination of lead from gasoline

will produce benefits which far outweigh the costs of this regulatory action. Thus we conclude that additional refining costs associated with our recommendations, although they appear to be high, are readily justified on the basis of resulting benefits for human health and environmental quality.

(i) Fuel Consumption

The evidence presented to the Sub-committee by the various witnesses on fuel consumption was contradictory. The MVMA spokesman stated that the proposed emissions reductions would "increase the Canadian motorist's fuel consumption by approximately 3% ..." Testimony from Environment Canada stated that vehicles with the three-way catalyst using lead-free gasoline would have improved fuel efficiency compared to Canadian vehicles without a catalyst and using leaded fuel.

The SEIA report states that fuel consumption for city and combined city-highway driving would be improved by 1.1% to 4.9%, depending on the model year of vehicle tested. A comparison between Canadian and U.S. "unleaded" vehicles (i.e. those with a Canadian reduction catalyst vs. the U.S. three-way catalyst) showed virtually no difference in fuel consumption for 1983 models.

It is difficult to rationalize these conflicting figures. The Sub-committee is inclined to believe, however, that the MVMA is stating a "worst case" situation and Environment Canada a "best case" situation. We suspect that the truth lies somewhere in between these estimates. In the absence of conclusive data, the Sub-committee accepts the conclusion of the SEIA study which states that effects on fuel consumption will be negligible or slightly positive.

(ii) Maintenance and Repair and the Role of Misfuelling

The effect of more stringent controls on maintenance and repair expenses was not specified by the MVMA except to state that costs would be increased because of the "more complex and expensive control equipment". Against that position is the evidence from a SEIA report on "Costs of Control" that there would not be "any impacts on durability, maintenance, or driveability as a result of the proposed standards"; this conclusion was reached by Pilorusso Research Associates after a survey of motor vehicle manufacturers. Moreover, using unleaded fuels and stainless steel components should enhance exhaust system durability. (We note here, also, that an emission control system is required, by law, to perform to specifications for 50,000 miles (80,000 km); if not poisoned by the use of leaded fuel, the system should last for the life of the car.) The SEIA report also concludes that driveability should be enhanced with the new system, including cold-weather starting and performance.

An important consideration in the use of lead-intolerant technology for the control of automobile emissions is the incidence and consequences of misfuelling; that is, substituting leaded fuel for the more expensive unleaded fuel. Accurate statistics on this practice are unavailable but small-scale surveys and estimates suggest that a significant amount of catalyst poisoning does occur through the improper and illegal use of leaded gasoline in vehicles equipped with catalytic converters. If these suggestions are correct, high emissions-control costs are being incurred with little benefit to the environment.

A 1982 survey of misfueling by the United States EPA found an overall misfuelling rate of about 12%. However, the rate was higher in areas without an inspection and maintenance (I/M) program and tended to increase with the age of the cars. For a 1975 automobile in a non-I/M area, the misfuelling rate was estimated to be 30.9%.

Moreover, the EPA feels that their survey probably underestimated the real misfuelling rates by a significant margin. In some non-I/M areas, the rate of drivers refusing inspections for misfuelling was as high as 44%. Also, the tests used to determine misfuelling probably produced a significant number of false negatives.

One approach to this problem is the adoption of an extensive, and expensive, inspection program. The Sub-committee believes that such a program would involve a needless additional expense to the taxpayer. As an alternative, the total elimination of leaded gasoline has much more appeal. As was noted above, lead emissions represent an important pollution problem in themselves. In fact, a recently released United States EPA study concluded that the United States would enjoy a net saving in excess of (U.S.) $700 million in lower medical costs and reduced car repair expenses by eliminating lead from gasoline. The Sub-committee concludes, therefore, that the effectiveness of more stringent emissions standards can be enhanced, and the costs of imposing these standards reduced, by the elimination of toxic lead from gasoline. We believe that a comprehensive solution to the problem of automobile emissions must include the eventual elimination of lead from gasoline.

The Sub-committee recognizes that additional refining costs are imposed on the petroleum industry as a result of the elimination of lead additives from gasoline. This trend toward an increased demand for unleaded gasoline will occur naturally, however, as the proportion of catalyst-equipped vehicles increases.

An eventual ban on lead is simply the final step in this process. More importantly, a ban on lead will reduce drastically the incidence of catalyst poisoning which will, in turn, reduce the need for inspection and for expensive catalyst replacement, and increase the overall effectiveness of the new emissions standards.

D. The North American Automobile Market

An important aspect of the adoption of current U.S. standards for Canadian automobiles will now be considered. This aspect concerns the Canadian automobile market as a component of the much larger total North American market. Testimony by automobile industry representatives stated that approximately 80% of the vehicles manufactured in Canada are sold in the United States and adhere to the more stringent exhaust emission standards south of the border. Further testimony revealed that, for General Motors cars at least, some 75% of the vehicles sold in Canada are in fact manufactured in the United States, incorporating exhaust systems designed to meet the less stringent Canadian standards. The bitter irony in this situation is that it would be illegal to sell these automobiles in the United States.

Testimony provided by the United Auto Workers Union in Canada agreed with the essentials of the manufacturers' testimony although the precise figures were different. Of the total North American car production, less than 9% is sold in Canada. Of total U.S. car production, less than 8% is sold in Canada, and of the total Canadian automobile production, about 82% is sold in the United States.

Whatever the precise statistics are for market and production allocation — and these, we recognize, will be different for individual automobile companies and for various vehicle lines — the basic point is quite obvious. Most of the automobiles built in Canada contain the superior three-way, closed loop catalyst system to meet more stringent U.S. emission standards and these vehicles are shipped to the United States for sale there. Most of the vehicles sold in Canada (75% or more of the total) are manufactured in the United States to meet lax Canadian emission standards.

(i) Incremental Costs and Changes in Emission Standards

The Sub-committee has received a wide range of testimony estimating the increased costs associated with more stringent automobile emissions standards and we recognize that emissions control is not free. Nevertheless, we do believe that the cost estimates discussed earlier are overstated.

When more stringent emissions standards were introduced in the United States, automobile manufacturers incurred significant research and development costs and all the production costs associated with the installation of catalytic convertors, engine modifications, and so on. Any determination of incremental costs due to more stringent standards in Canada must be calculated differently because the research and development costs have already been paid.

Under the 1965 Automotive Product Trade Agreement (commonly referred to as the Auto Pact), Canada and the United States have become a single automobile market. The major impact of this agreement has been to rationalize production towards one very large market, rather than towards one large market and one small market. As a result, the bulk of Canadian production (75% - 80% depending upon the manufacturer) is destined for eventual sale in the United States while the bulk of Canadian sales is accounted for by vehicles produced in the United States.

The 1965 Auto Pact has enabled producers to take advantage of minimum efficient size of plant and to enjoy the benefits of very long production runs. Both items are essential in minimizing production costs. The existence of significantly different emissions standards in Canada and the United States, in effect, again divides North America into two markets (actually three markets because of the different California standards) and destroys some of the cost advantages which would accrue to product standardization.

Production runs are now shortened with added changeover costs being incurred to accommodate Canadian standards. Inventory costs are higher as the number of different specifications (i.e. engines, catalytic converters, etc.) are increased. Furthermore, the widely differing tasks required to produce vehicles to both Canadian and American specifications makes quality control more difficult and expensive.

The adoption of identical emissions standards for NO_x and HC in Canada and the United States will restore again the cost advantages originally achieved through integrated production under the Auto Pact. This is not to suggest that the cost advantages of standardization outweigh the added costs of adding superior emission-control devices to Canadian cars. However, these cost reductions do exist and logically must be weighed against the cost increases of adding three-way reduc-

tion catalysts to cars sold in Canada. The Sub-committee is frankly mystified that the auto industry representatives did not discuss this aspect of the issue during their appearance before us.

E. Conclusions and Recommendations

The Sub-committee has considered carefully the various issues and testimonies associated with motor vehicle NO_x emissions. The production of NO_x in the transportation sector contributes significantly to the North American acid rain problem and, therefore, NO_x reduction must be an integral part of any acid rain control strategy. Additionally, there are many good arguments for consideration of automobile exhaust emissions in a broader context.

As we have discussed in some detail, photochemical smog and ozone pollution are a result of exhaust emissions from the transportation sector and derive from reactions between NO_x and hydrocarbon pollutants. Also, carbon monoxide has a detrimental effect on human health, as do lead emissions.

Although the Sub-committee is specifically concerned with the issue of acid rain, we believe that motor vehicle emissions should be treated as a group in order to effect the most cost-efficient control strategy. The total cost of reducing NO_x, HC, CO, and lead emissions concurrently is less than the sum of reducing each pollutant individually. Moreover, the effectiveness of controlling any one type of emission is enhanced if all emissions are reduced as a "package".

The Sub-committee makes the following recommendations:

1 Recommendation

The Sub-committee recommends that the emission standards in Canada for nitrogen oxides (NO_x) be changed from 3.1 grams per vehicle mile to 1.0 gvm; for hydrocarbons (HC) from 2.0 gvm to 0.41 gvm; and for carbon monoxide (CO) from 25.0 gvm to 7.0 gvm.

Because the change to more stringent standards involves the use of established and proven technology and because the standardization of equipment and production schedules in the U.S. and Canada will make for a more efficient industry, the Sub-committee believes that the enforcement of the new standards can be achieved sooner rather than later. Since a large proportion of the new cars sold in Canada each year are equipped with a catalyst system which requires unleaded gasoline, lead-free fuel supply should not be a major problem.

2 Recommendation

The Sub-committee recommends that the new emission control standards should be required for the 1986 model year.

For the various reasons discussed above, the Sub-committee believes that there are significant environmental, social, and economic benefits to be realized from removing lead from gasoline.

3 Recommendation

The Sub-committee recommends that lead be gradually phased out as a gasoline additive and that leaded gasoline be banned in Canada by 1995.

The Sub-committee received testimony that the U.S. Environmental Protection Agency is in the process of developing revised NO_x emission standards for heavy-duty vehicles. In 1980, heavy-duty vehicles produced 210,000 tonnes of NO_x in Canada, about 12.1% of total NO_x emissions. The Sub-committee feels that any positive change in heavy-duty vehicle emission control in the United States should be simultaneously considered for adoption in Canada. We think it would be most unfortunate to witness the development of another situation in the automobile industry where Canadian standards are significantly less stringent than those in the United States.

4 Recommendation

The Sub-committee recommends that Transport Canada consult fully with the United States Environmental Protection Agency to ensure that Canadian and American emission standards for heavy-duty vehicles are compatible.

The Sub-committee listened with interest to Dr. Slater's description of Canada's environmental review process. In brief, the process exists to ensure that policies and regulations are not adopted by government without first determining what the costs and benefits will be for the Canadian public.

The Sub-committee supports the principle of an environmental review process. *However, in the case of motor vehicle emissions control, it appears that the system is inappropriate, wasteful, and unacceptably cumbersome.*

Clearly, there are situations where the Canadian and United States governments should act in concert to solve a common problem. This is particularly true in a sector such as the automobile industry where production is integrated on a continental basis. In a sense, the SEIA process as regards motor vehicle

emissions is attempting to "re-invent the wheel"; the fact that the "wheel" will bear a "Made in Canada" label cannot obscure the fact that, in this instance, the process has generated a massive duplication of effort and much unnecessary expense and delay.

Finally, the Sub-committee believes that authority over vehicle exhaust emissions is primarily an environmental concern rather than a question of vehicle safety. Lead emissions from automobiles are regulated under the *Clean Air Act* which is administered by Environment Canada. In STILL WATERS, we recommended that emissions of nitrogen oxides, hydrocarbons, and carbon monoxide from motor vehicles should be regulated under the *Clean Air Act* rather than the *Motor Vehicle Safety Act*. The Sub-committee has not changed its view on this point and we therefore repeat the recommendation made in 1981.

5 Recommendation

The Sub-committee recommends that legislative authority to regulate motor vehicle emissions through standards applicable to manufacturers and distributors be transferred from the *Motor Vehicle Safety Act* to the *Clean Air Act* and hence from the Ministry of Transport to the Department of Environment which already has significant responsibilities in the area of air pollution.

THERMAL POWER GENERATION

In 1980, Canada's electrical utilities produced 71 million megawatt hours(mWh) of electricity from fossil fuels. The generation of this power resulted in the emission of 745,000 tonnes of SO_2 and 245,000 tonnes of NO_x. In 1983, fossil fuel-fired generation by Canadian utilities totalled 76.7 million mWh, an increase of 8.2% (see Table B). Emissions data on a province-by-province basis are not available for 1983.

The 1980 data indicate, however, that emission levels are not uniformly correlated with amounts of thermal power generation. Eastern Canadian utilities produce much more SO_2 emissions per mWh of electricity than do western Canadian utilities. On the other hand NO_x emissions are at least as much a problem in the west as in the east. Ontario, the largest source of utility acid-gas emissions, is slightly cleaner than average with respect to NO_x and slightly dirtier than average with respect to SO_2.

Since 1980, most provinces have reduced their reliance on fossil fuel-generated electricity, in some instances by very significant amounts. Newfoundland, Manitoba and British Columbia have all made increased use of hydroelectric generation to reduce their reliance on fossil fuels. New Brunswick has added nuclear generating capacity while Prince Edward Island has increased its purchases of power from New Brunswick.

Ontario, Saskatchewan and Alberta have all increased their production of fossil fuel-generated power from 1980 to 1983. This generation increased by 14% in Ontario and 24% in the two prairie provinces.

Over this three-year period, very little has been done to control acid gas emissions from thermal power plants. The Sub-committee is aware only of Ontario Hydro's installation of low NO_x burners at two of eight boiler units at the Nanticoke generating station and the gradual reduction in the average sulphur content of coal used by that utility. We are not aware of any specific programs by any of the other utilities to reduce their acid-gas emissions.

Assuming that no significant changes took place in the composition of fossil fuel used by these utilities between 1980 and 1983, we estimate that total NO_x emissions have risen by approximately 4% since 1980 while SO_2 emissions have fallen by approximately 2%. The reason for this disparity is that generation tended to increase most in provinces which are cleaner than average with respect to SO_2 (Saskatchewan and Alberta) while falling in provinces which are dirtier than average (New Brunswick, Manitoba, Newfoundland).

The provinces most adversely affected by this change in the pattern of thermal generation are Alberta and Saskatchewan where we estimate SO_2 and NO_x emissions to have increased by 24% since 1980. In these two provinces, NO_x is actually a larger problem than SO_2 a situation which is quite different from other provinces. However, this problem may also be viewed as an opportunity which these utilities have failed to take advantage of. We recognize that the control of SO_2 in western Canada's power plants is expensive and difficult because of the low sulphur content of the input fuels. On the other hand, NO_x control tends to be less expensive than SO_2 control. The production of NO_x is caused by chemical reactions which occur during combustion; by controlling this process, NO_x reductions can be achieved. Western utilities have always, in discussions, stressed their sulphur emissions, citing high control costs and the low sulphur content of input coal. We feel that the debate in the West should place more emphasis on NO_x emissions since the potential for control is better for this pollutant than for SO_2.

In the Maritime provinces, no control programs for thermal power plants are in place and none have been finalized for the forseeable future. (Significant SO_2 and NO_x controls may be effected at Coleson Cove in New Brunswick and Point Tupper, Nova Scotia if conversions from oil-burning to coal take place). Any reduction in emissions since 1980 has occurred because of the decreased reliance on fossil fuels; however, we do not know whether this trend can be expected to continue in the future. According to evidence from the Environmental Protection Service (EPS) submitted to the Sub-committee at the St.John's public hearing, the use of coal for electricity generation in the Maritimes is expected to increase. Several SO_2 control options are being investigated, including coal washing and blending, fluidized bed combustion, and flue-gas desulphurization. The latter two options are unlikely to be employed in the near future, according to EPS. Rather, that agency views the use of indigenous low-sulphur coal and coal washing to be the most appropriate short-term control options. Whatever choice is ultimately made, however, no programs are currently in place. The only encouraging note in this area is the fact that the Lingan thermal generating station in Nova Scotia utilizes state-of-the-art technology for the control of NO_x emissions.

Ontario is by far the largest source of acid-gas emissions produced by the thermal generation of electricity. In 1980, that province accounted for 50% of total SO_2 and NO_x emissions from this sector. In 1983, in fact, we estimate that Ontario's contribution is closer to 60%. For this reason, we will consider the situation with respect to Ontario Hydro in some detail.

Table B

A. Ontario Hydro

In June 1983, officials from Ontario Hydro testified before the Sub-committee in Ottawa. That testimony consisted essentially of an outline of projected SO_2 and NO_x emissions, a discussion of the Ontario Government's regulations on future emissions levels, and the corporate strategy designed to meet those limits.

The provincial control order imposed on Ontario Hydro restricts combined SO_2 and NO_x emissions to 450,000 tonnes per year as of 1986 and 300,000 tonnes per year as of 1990; SO_2 emissions cannot exceed 87% of these totals. These limits contrast with 1980 total emissions of approximately 460,000 tonnes; 530,000 tonnes in 1982; and 513,000 tonnes in 1983. In its testimony, Ontario Hydro projected total emissions to fall continually from 1983 levels. Now, however, the corporation is projecting total emissions for 1984 to be in the range of 540,000 tonnes to 600,000 tonnes, a significant increase over 1983.

The reasons for this increase in 1984 emissions, and the source of the Subcommittee's concern about future emissions, lies squarely with Ontario Hydro's strategy for combatting acid gas emissions. While the corporation expects to make increasing use of low NO_x burners, low sulphur coal, and hydro purchases from neighbouring provinces, the bulk of acid-gas control is to come about through the substitution of nuclear generating capacity for coal-fired generating capacity. Coal-generated electricity is to represent not only a smaller proportion of total electricity consumption through the 1980s, it is also to become increasingly a source of peak generating capacity only.

A number of events, starting in the summer of 1983, have led the

Sub-committee to question the feasibility of this strategy. The recent shutdown of nuclear generating capacity at Pickering has led to a greater reliance on coal generation. And because of Ontario Hydro's strategy, this coal generation is largely uncontrolled. There is every possibility, then, that Ontario Hydro may not be able to effect a significant reduction in acid gas emissions in the near future.

This possibility should not come as a surprise. Even before the shutdown of some nuclear capacity in Ontario, the adverse effects of backing up nuclear capacity with coal generation was described to the Sub-committee. Testimony by Friends of the Earth stated "Even if the need for this coal back-up could be limited to forced outages and unscheduled maintenance on nuclear units, CANDU performance to date indicates the coal plants would be called upon at least 10% of the time, thus resulting in *more* sulphur emissions than the cheaper option of foregoing more nuclear capacity and installing scrubbers instead". Since we received that testimony, the performance rating of CANDU reactors has undoubtedly fallen, adding even more credence to the contention that "It is quite possible that Ontario Hydro will actually produce *more* acid rain with a nuclear dominated system using dirty coal for back-up capacity than with a system where more nuclear capacity is rejected in favour of clean coal (i.e. 90% sulphur removal)".

If CANDU performance over the past year is indicative of future reliability, Ontario Hydro's ability to meet its emission limits for 1986 and 1990 must be seriously questioned. The only "clean" option for replacing lost nuclear capacity is to purchase additional amounts of hydro electricity from neighbouring provinces. It is unlikely, however, that this option would be available to Ontario Hydro if large quantities of power were involved. Both Quebec and Manitoba are actively seeking contracts for electricity exports to the United States and they may not be able to meet any significant increase in demand from Ontario. Moreover, Ontario's own exports to the United States are increasingly taking the form of firm (non-interruptible) power.

Thus, the only obvious alternative for Ontario Hydro is to increase the use of coal generation in the event of serious and unanticipated shutdowns of nuclear generating capacity. The fact that the Ontario government's control order is non-appealable gives little comfort to the Sub-committee. Faced with a possible choice between the uncontrolled burning of coal and the rationing of electrical power, we believe the Ontario Government will choose the former.

In fact, the Sub-committee has very little confidence in the stated projections and acid rain strategies of Ontario Hydro. In October 1980, when the corporation appeared before the Sub-committee in Toronto, we were told that Ontario Hydro was an "insignificant contributor" to Canada's acid rain problem and, therefore, no drastic action by the utility was required. Three months later, it was announced that the utility was planning to design and install two flue-gas desulphurization units to contain emissions from 1000 mW of coal-fired capacity at either Lambton or Nanticoke. These scrubbers were to cost $500 million. In addition, low NO_x burners were to be installed at Nanticoke, Lakeview and Lambton.

Since then we have heard yet a different story. In June 1983, the utility appeared before the Sub-committee in Ottawa, stating that scrubbers were not needed to meet the new Ontario Government standards because of revised forecasts indicating reduced electricity demand (from 3.1% yearly growth as estimated in 1981 to 2.1% annual growth as estimated in 1983). Thus, it was argued that the planned nuclear capacity could account for a greater proportion of total generation and together with coal blending would be sufficient to maintain SO_2 and NO_x emissions within the mandated limits. Moreover, in that testimony, the utility stated its intention to install low NO_x burners at all of Nanticoke's boiler units — no mention was made of the Lakeview and Lambton stations, however.

Since then, the corporation has revised its demand forecasts upward and has abandoned plans to mothball additional coal-fired generating capacity. It is our understanding that Ontario Hydro is once again considering the installation of scrubbers at one or more coal-fired plants.

Over the past four years, Ontario Hydro has routinely modified its projections for both acid-gas emissions and electricity demand. It has also significantly revised its acid rain abatement strategy over this period. What is missing from this continuously-shifting equation is a concrete program of SO_2 and NO_x control that is immune from the vagaries of consumer demand and unscheduled failures of CANDU nuclear units.

The Sub-committee feels that Ontario Hydro's stated acid rain control strategy is imprecise and undependable. This Crown Corporation, the largest and most powerful electrical utility in the country, situated in Canada's industrial heartland, has the responsibility to lead the way in acid rain control, to set an example for other industries to emulate. That it has not done so, but instead has forfeited its leadership role, is at best unworthy and, at worst, irresponsible.

SO_2 CONTROL IN THE NON-FERROUS SMELTING SECTOR

In *STILL WATERS*, the Sub-committee identified Canada's non-ferrous smelting industry as the largest domestic source of acid rain-causing emissions. This situation continues to hold true despite the fact that production cutbacks and strikes have significantly reduced SO_2 emissions from this sector since 1980. As a consequence this sector continues to be the major focus of our attention.

We recognize the financial difficulties currently facing the non-ferrous smelting industry, just as we recognize the high capital and operating costs which are associated with increased SO_2 control. The following discussion will highlight several key aspects of pollution control in this industry and the role which can be played by government in assisting and encouraging this control effort.

A. The State of the Industry

The mineral processing industry in Canada is currently on the verge of recovery from the severely depressed state which has characterized this sector over the past three years. It has taken longer than anticipated to recover from this downturn and it is not clear that all parts of this industry can expect even a moderate recovery.

The industry's problems are two-fold. In the first place, product demand is very sensitive to the overall level of world economic activity. As the western world entered the most severe recession since the 1930s, the smelting sector was particularly hard hit by these cyclical factors. Secondly, the industry is undergoing some structural changes which are longer-term in nature and are, therefore, more worrisome to Canadian producers. These changes include the increasing world importance of producers who do not respond to normal market signals; e.g. government-owned enterprises whether in socialist or market economies, and third-world producers who are in effect subsidized by international development agencies. Additionally, Canada has become a relatively high-cost producer in some product lines.

The demand for metals has fallen dramatically through the recent recession but the production of metals has not fallen to the same degree. Thus, inventories of metals have risen to undesired levels, putting further downward pressure on prices. Even those Canadian operations which are low-cost by world standards have not been able to meet production costs at current prices.

Analysts in the private sector and government concede that it will take several years before corporate balance sheets are again in a healthy position. The following examples demonstrate the precarious position of these companies. Since 1981, Falconbridge Ltd. has lost a total of $97.8 million, with annual losses averaging 7% of shareholders' equity each year. Over the same period, INCO lost a total of more than $1,000 million U.S., averaging 22% of shareholders' equity at the start of each year. Noranda, a more diversified company than either INCO or Falconbridge, has lost $48 million since 1982.

B. The Tax System and SO_2 Control

The current state of the non-ferrous smelting industry is such that most firms will find themselves in financial difficulty if they were to undertake major abatement programs. The tax system plays an important role in this regard. On the one hand, it currently discriminates against certain pollution control activities. On the other hand, it can be used to improve the liquidity position of firms engaging in abatement activity and ease the financial burden of pollution control.

(i) Scientific Research Expenditures and Technology

A wide range of abatement technologies for smelters is currently in existence or in the development stage. These technologies vary widely in terms of their abatement capability, their economic efficiency and their adaptability to existing production processes. From the point of view of polluting firms, certain abatement methods impose too heavy a burden on corporate finances. From the point of view of governments which assist in the financing of pollution control, the cost effectiveness of technology is also important. Moreover, smelters employ very complicated production processes and no two smelters are alike. Even known technologies must be tailored to specific situations. Minor changes in the smelting pro-

cess may lead to significant changes in, say, the strength of off-gases. As a consequence, the effectiveness of control attempts is highly sensitive to even small changes in production.

This is not to suggest that current technology is inadequate to meet the acid rain problem, nor is it an argument for delaying any serious attempt to resolve this problem. Rather, it is a recognition that pollution control is a complicated and evolving process. The methods used to eliminate acid gas emissions today will differ from the ones used tomorrow. And the method used to control emissions will likely differ from smelter to smelter.

The Sub-committee therefore recognizes that technological development in this area must continue and that further activity in scientific research should be encouraged. In this regard, the *Income Tax Act* plays an important role.

The definition of scientific research is set by regulation. Simply put, it refers to systematic investigation through experimentation or analysis in scientific or technological areas. Research can be basic, applied or developmental in nature. It excludes: "... commercial production of a new or improved material, device or product or the commercial use of a new or improved process." Furthermore, qualifying expenditures for an additional scientific research allowance are restricted in several notable ways: the expenditures must be made in Canada; they must be for property that was unused when acquired; they may not include land; and they may not include such prescribed costs as interest and borrowing costs, legal fees, administrative costs, etc.

Under existing federal tax law, firms operating in Canada may deduct scientific research expenditures of a capital nature incurred in Canada, and expenditures of a current nature incurred here or elsewhere. The *Income Tax Act* also provides for additional allowances for scientific research to encourage firms to increase their research and development activity. While the Sub-committee feels that these allowances are adequate, they are applied in an excessively narrow manner.

It is not the intention of the Sub-committee to present here a detailed evaluation of this part of the income tax system. We do feel, however, that *current restrictions are unduly rigid and that the definition of scientific research is too narrow to suit the needs of the smelting industry.*

The capture and neutralization of smelter gases is a complicated process. Abatement technology cannot be simply taken off the shelf and installed in a smelting complex. Technology that works "on paper" or in the laboratory might not work (or might not work as was anticipated) at the stage of the pilot plant or at the stage of commercial operation. It is essential then that scientific research be regarded as a process which extends through all steps of experimentation, including the commercial-scale testing of products, devices or processes. The Sub-committee feels that the tax system should not discriminate against any particular aspect of scientific research, whether it be the use of existing facilities vs. the use of new facilities, or the use of pilot plant experimentation vs. the use of commercial-scale experimentation.

With respect to these points, we present three examples of research undertaken by major polluters in order to test the practicality and efficacy of processes designed to curtail smelter SO_2 emissions.

Noranda Mines Ltd. investigated the possibility of capturing SO_2 gas from its Horne smelter and using this gas to produce magnesium sulphate which is a secondary plant nutrient and can be used in fertilizer. This process is the property of the Société nationale de l'amiante (SNA). The SNA laboratory data looked promising and it appeared that the market for magnesium sulphate had great potential. It seemed, then, that an economically viable solution to much of the Horne smelter's SO_2 emissions had been found.

A small-scale pilot plant was built to test this technology. Although the process did work, the pilot plant experiment indicated that the costs of this process were far in excess of what had previously been suggested. The project was, therefore, considered to be a failure. *Nevertheless, the expenditures incurred were classified as scientific research for tax purposes.*

INCO Ltd. has recently completed research on a new "roast reduction" nickel smelting process which would increase smelter efficiency, improve the workplace environment, increase metals recovery and, most important for the Sub-committee, significantly improve the capture of sulphur dioxide emissions. From early 1980 to 1982, the company undertook a $24 million commercial-scale test of this process at its Thompson smelter. INCO has also spent approximately $6 million to date to evaluate the feasibility of applying this process to the Copper Cliff smelter.

This research has proven to be largely successful. The advantages of roast reduction smelting are primarily in the area of emissions curtailment. The experiment has demonstrated the importance of commercial-scale testing as a component of the research process. *However, this experiment does not qualify as scientific research.* Revenue Canada's interpretation of such large-scale testing is that it constitutes commercial production rather than research and thus is ineligible for the additional allowance for scientific research.

The third example refers to the attempt by Falconbridge to increase its efficiency while controlling SO_2 emissions through construction of a nickel-iron refinery. To quote Mr. William James, Chairman of the Board of Falconbridge Ltd., in his testimony before the Sub-committee: "We had the technology, we conducted extensive laboratory tests, we operated a pilot plant. Everything seemed to work out fine. But when we built the actual refinery, the process simply did not work." *The construction of the refinery by Falconbridge would not be considered scientific research; yet, clearly , it proved to be the vital component in this investigation to improve efficiency and reduce emissions.*

We believe that the examples cited above support our contention that the current definition of scientific research is too restrictive. Indeed, the commercial-scale testing of production or abatement processes is well within the ambit of scientific research.

The Sub-committee therefore makes the following recommendation.

6 Recommendation

The Sub-committee recommends that Regulation 2900 of the *Income Tax Act* be re-written to permit commercial-scale testing as a qualifying expenditure for the purposes of computing the scientific research deduction and the additional allowance for scientific research. These changes are to apply to expenditures incurred after 31 December 1979.

In recent years, smelting firms have engaged in expensive research and development activity related to acid rain. For this reason we make Recommendation 6 retroactive to 1980.

(ii) Capital Cost Allowances for Abatement Equipment

The cost of long-lived assets such as machinery and structures can be deducted from income for the purpose of computing tax liabilities. The nature of these assets is such that these costs can only be deducted over a number of years, often well beyond the year in which the actual expenditures were made.

By accelerating the rate at which capital expenditures can be written off against income, corporate tax liabilities are deferred until some future date. This tax deferral can be thought of as an interest-free loan from the government and it is this feature which benefits firms. Accelerated capital cost allowances do not reduce tax liabilities, they only defer payment.

Federal income tax regulations specify two classes of assets which are related to pollution control and which benefit from accelerated depreciation. These classes relate to air and water pollution control.

When the Sub-committee's report *STILL WATERS* was written, pollution control equipment could be written off over a two-year period; i.e. 50% in each year. The November 1981 federal budget increased this period to three years: 25% write-off in the first year; 50% in the second year; and 25% in the third year. This new legislation contained a "grandfather" clause, allowing expenditures which had taken place, or had been contracted for, to continue to take advantage of the two-year rule. Ontario, which collects its own corporate income tax, still allows a two year write-off.

Many classes of assets enjoy accelerated depreciation because it was felt that the original tax system had actively discouraged the accumulation of capital. Thus the apparent preferential treatment for pollution-abatement equipment may in fact be illusory. The Sub-committee, therefore, makes the following recommendation.

7 Recommendation

The Sub-committee recommends that equipment used in the abatement of SO_2 and NO_x emissions be eligible for a 100% write-off in the year in which the capital expenditures are made.

In order to further encourage the acquisition of capital goods deemed to be beneficial to society, bonus capital cost allowances can be made available to firms. Such a provision is infrequently employed in Canada; however we believe it to be appropriate in this case.

8 Recommendation

The Sub-committee recommends that equipment used in the control of acid gas emissions be eligible for an additional capital cost allowance equal to 10% of the expenditures on such equipment. This allowance is to be made available in the year in which the expenditures are incurred and is limited to properties purchased by 31 December 1994.

The effect of Recommendations 7 and 8 is to allow an immediate 110% write-off of capital expenditures for acid gas control.

Under current federal tax law, accelerated capital cost allowances under Class 27 are allowed for properties the *primary* purpose of which is the prevention, reduction or elimination of air pollution as determined by the Minister of Environment. We purposely stress the word *primary*. As it stands, the definition does not recognize the wide variety of actual and potential technologies which can be employed to control emissions. Some methods possess certain advantages over existing technolo-

gies: they can enhance productivity while at the same time effecting emissions curtailment. A capital property which is acquired primarily to improve firm productivity but which also reduces emissions by, say, 40% will not be approved as pollution control equipment and thus not benefit from accelerated depreciation. For example roast reduction smelting is a technology developed by INCO which can significantly reduce SO_2 emissions, although it is not *primarily* a control technology. Under current rules only a small portion of expenditures on this process would qualify for accelerated allowances.

Furthermore, we are advised by industry officials that where a grey area exists with respect to the classification of properties for tax purposes, "good samaritans" may in fact be penalized. For example capital equipment which is installed voluntarily may not qualify as pollution control equipment whereas that same capital equipment will qualify if installed in response to a governmental control order.

The Sub-committee feels that the tax system should not discriminate against abatement efforts which are achieved in a cost-efficient manner, nor do we feel that the tax system should distort the choice of abatement technology. With this in mind we make the following recommendation.

9 Recommendation

The Sub-committee recommends that, upon approval by the Minister of the Environment, the one-year capital write-off should apply to *all* properties which effect a significant reduction in acid gas emissions, whether or not the capital expenditure is primarily environment-related.

The value of accelerated capital cost allowances depends upon the distribution of expenditures over time, the rate at which corporate profits are taxed and the rate of interest. To quantify the value of the Sub-committee's recommendations on accelerated capital cost allowances and the additional allowance, consider the case of industry capital expenditures of $926 million, as outlined in Table C, spread equally over five years. With corporate profits taxed at 50% and a 10% interest rate, the cash value of the Sub-committee's recommendations would be $101 million in each of the first and second years of expenditure. This contrasts with cash values of $23 million in the first year and $69 million in the second year of expenditures under the current tax system. The effect of the Sub-committee's recommendations is to increase industry cash flow by $78 million in the first year of construction and $32 million in the second year. By doing so, operating risk is reduced for the firms involved.

If total industry capital expenditures amount to the higher figure shown in Table C (i.e. $1,100 million), the Sub-committee's recommendations would increase total corporate cash flow by $93 million in the first year of construction and $38 million in the second year.

Accelerating capital cost allowances produces benefits by increasing corporate cash flow early on rather than in later years. Under the scenarios cited above, the present value of this discounted cash flow is approximately 10% greater with a one-year write-off than it would with a three-year write-off. The additional allowance increases this benefit by a further 10%. In addition, broadening the definition of eligible expenditures also increases the value of this benefit although we have not been able to quantify the value of this benefit. If, however, the firms in question do not have sufficient profits against which to employ these deductions, these additional benefits are reduced or eliminated.

(iii) Loss Carry-overs

The non-ferrous smelting industry in Canada has been particularly hard hit by the recent recession, and for many of the companies involved, the recession is not over. For example, since 1981, INCO's shareholders have incurred total losses after taxes which are just over $1,000 million U.S. Approximately one-half of this total is attributable to operating losses in 1982 and 1983 while the remainder is due to the writedown of the company's assets in American and Guatemalan ventures. This situation is not unique. Falconbridge, Noranda, and Hudson Bay Mining and Smelting have also lost significant amounts over this period.

The federal *Income Tax Act* allows business losses to be carried over to other years and so offset profits in those years. In effect, businesses incur negative taxes in losing years which can be used to offset positive tax liabilities in profitable years. The ability to carry over losses is, however, limited. A business may claim, as a deduction from income, non-capital losses for the seven preceding years and the three following years. Put another way, losses can be carried forward seven years and carried back three years. Previously, these losses could only be carried forward five years and back one year. In addition, a business may deduct net capital losses from net capital gains in the three following years and all preceding years. Previously, net capital losses could only be carried back one year.

Carry-back provisions differ in their benefits to the corporation from carry-forward provisions. When a loss is carried back, it is applied to income which has been taxed and therefore constitutes a tax refund. The firm knows its past profits and is certain of the benefits it will receive. Moreover, the tax refund constitutes a positive cash flow in the current period.

A loss carried forward, on the other hand, is applied against uncertain future income and the beneficial cash flow effects will not occur until some time in the future.

As was mentioned above, the non-ferrous metals industry has incurred significant losses over the past three years. At present, there is some possibility that the carry-over provisions for losses will soon become binding constraints, especially if metals markets do not turn around soon and do not turn around significantly. In some instances firms may not have sufficient future income to make use of losses carried forward.

This concern is compounded by the desire to initiate significant SO_2 abatement in the near future. Abatement expenditures will not, for the most part, generate net income or sufficient cost savings to counter these added costs. Thus they will create losses for tax purposes. This could eliminate the possibility of offsetting the future tax liabilities of these firms with present losses.

Given the recent state of the economy, existing provisions may unduly and unintentionally penalize firms that spend large sums on abatement efforts. Moreover, we do not want to see this situation used as an argument for a delay in any serious control effort.

One available option is the use of tax credit financing. Tax sheltered securities are currently available to investors who finance the exploration ventures of mining companies that are not in a tax-paying position and that do not expect to be in a tax-paying position for several years. This feature is made possible by proposals outlined in the April 1983 federal budget which allow deductions to be taken by investors for expenditures which qualify as Canadian exploration expenses or as Canadian development expenses. In other words, individuals who purchase specially designated new common shares may earn tax deductions which have been transferred from the company issuing the new shares.

The Sub-committee feels that the government departments concerned should take the steps necessary to ensure that compliance with an abatement program does not impose an undue tax burden on the firms involved.

It has been suggested to the Sub-committee that the emphasis of the tax system's carry-over provisions should be with loss carry-back. This contrasts with the current system's emphasis on carry-forward provisions.

We recognize the importance of this matter to the smelting industry. Tax loss provisions in the *Income Tax Act* are applied equally to all industries with distinctions made only between current losses and net-capital losses. While the Sub-committee does not wish to suggest major changes to this part of the Act to provide benefits to only one sector, we feel that the present emphasis on carry-forward provisions is inadequate. (This matter will be dealt with primarily through our formulation of a direct assistance package for the smelting sector.) The Sub-Committee makes the following recommendations.

10 Recommendation

The Sub-committee recommends that the *Income Tax Act* be amended to increase loss carry-back provisions to 7 years for all losses.

11 Recommendation

The Sub-committee recommends that the Departments of Finance and Environment consider the feasibility of allowing investors to take deductions for pollution-control expenditures incurred by firms in the non-ferrous smelting sector.

(iv) Other Financing Options

The tax system allows for a credit to be deducted from taxes otherwise payable for investments in qualifying properties. This tax credit varies by region, from a minimum of 7% of qualified capital cost to a maximum of 20% of capital cost in Atlantic Canada and the Gaspé Peninsula.

It has been suggested to the Sub-committee than an increase in the investment tax credit from 7% to 10% be made available to INCO in order to help finance an abatement program at the company's Sudbury operations. We do not feel this to be appropriate since the investment tax credit is primarily an instrument of the *Regional Development Incentives Act*. Its provisions are designed to promote regional development and the rates of tax credits have been established with that purpose in mind. Moreover, we do not wish to employ an assistance package which treats plants differently, on the basis of their location.

In this vein we are also hesitant to endorse a number of recommendations regarding the use of existing government programs to help finance abatement efforts. It was suggested that federal-provincial "General Development Agreements" and the "Industrial and Regional Development Program" could be used to provide assistance for smelter clean-up. In both cases, the thrust of these programs is to enhance regional development and thus their provisions may not be appropriate for an acid rain program for the smelting sector.

As a consequence, the Sub-committee feels that the major component of an acid rain financing program should be one which distinctly and exclusively deals with the problem at hand. The following section proposes just such a program.

C. Direct Government Assistance For SO_2 Control At Smelters

The Sub-committee has received a wide range of evidence concerning the feasibility of SO_2 control at smelting operations, the costs of such control, and the economic implications for the smelting sector. We have weighed this evidence carefully, taking into consideration the financial positions of the firms involved while at the same time considering the enormous damage to the environment which will result from a lack of (or delay in) any serious policy action in this regard.

The Federal and Provincial Governments are currently undertaking studies to determine how and where Canada can achieve its goal of reducing acid rain-causing emissions by 50% by 1994. The Department of Energy, Mines and Resources has undertaken a study of the non-ferrous smelting sector which is but one contribution to this investigation. We recognize that the government departments studying this matter have access to far more resources than does the Sub-committee. It is thus unrealistic for the Sub-committee to attempt to duplicate the work of Canadian ministries in devising a detailed strategy for SO_2 and NO_x control. *Nevertheless, we feel that certain principles should be adhered to in any such strategy.*

In the first place, the bulk of the abatement effort should be directed towards the non-ferrous smelting sector in Canada. This sector is the largest single source of acid rain-causing emissions in Canada and, as a result, a control strategy must rely heavily on the abatement efforts of this industry. More important, however, is the fact that abatement in this sector tends to be significantly less costly than abatement efforts elsewhere. In the Sub-committee's 1981 Report, *STILL WATERS*, we examined the relative costs of controlling SO_2 emissions from various sources. The Report concluded that "... the per unit costs of reducing SO_2 emissions are significantly lower for non-ferrous smelters than for power plants."

The evidence made available to the Sub-committee indicates that this conclusion still holds and we add that the per unit costs of controlling SO_2 from non-ferrous smelters are significantly lower than the per unit costs of controlling NO_x from transportation vehicles.

The reader should not infer from this that these other sectors should not make their contribution to the control of SO_2 and NO_x emissions. The Sub-committee is simply suggesting that the funds available for a control program are not unlimited and, therefore, we should attempt to ensure the greatest level of abatement for any level of expenditure.

In fact, the Department of Energy, Mines and Resources (EMR) study discussed in the next section suggests that process changes in a number of smelters can significantly reduce SO_2 emissions and still be justified on purely economic grounds. In other words, the portion of cost which is attributable to SO_2 control can, in some instances, approach zero. This is clearly a most optimistic scenario and might well not occur. Nevertheless, this possibility does exist for the smelting sector whereas it does not exist for other sectors such as fossil-fuelled thermal power generation or transportation.

Although we believe that the smelter sector should play the leading role in SO_2 control, we do not believe that this sector should bear a disproportionate share of these abatement costs. On equity grounds, firms involved in the smelting of non-ferrous metals should not be asked to make financial sacrifices that are not asked of firms in other sectors. On a more practical level, we recognize that the smelting industry simply does not have the resources at present to undertake this kind of a program, *although we should point out that a number of these firms were not particularly agreeable to SO_2 control even when they had the resources to do so.* Moreover, we recognize that this sector has the potential to continue making a significant contribution to the Canadian economy in general, and to numerous remote communities in particular.

In February 1984, the Sub-committee visited Flin Flon and Thompson, Manitoba to visit the smelting operations in those two communities and to meet with representatives of the local unions: Local 7406, United Steelworkers of America in Flin Flon; and Local 6166, United Steelworkers of America in Thompson. In both cases we found our discussion with labour to be most fruitful. They took a co-operative attitude toward the resolution of this problem and endorsed the concept that some form of limited public assistance should be employed in any acid rain program. Both locals have played an important role in improving working conditions at their smelters and improving environmental conditions in their communities. The role of unions in combatting acid rain is then just the logical next step in labour's existing environmental involvement.

For these reasons, the Sub-committee accepts the view that government assistance to the industry must form an integral part of any acid rain strategy. We have heard tes-

timony from a broad spectrum of Canadian society: industry spokesmen, union leaders, environmental groups, concerned individuals, and government officials. A broad concensus has emerged in favour of some form of government assistance to the smelting industry since, to borrow a phrase used by the Société pour vaincre la pollution, "Pollution is a collective responsibility". In an open letter to President Ronald Reagan, dated 14 March 1984, six senior Canadian Church Leaders stated: "... some Canadian Churches are pressing federal and provincial governments to be more assertive in regulating those companies [INCO and Noranda] and making immediate action financially possible."

We have discussed several options above regarding the use of the corporate income tax system to provide assistance in this area and we have made appropriate recommendations. However, these measures may not be sufficient to allow firms to undertake the capital expenditures required. Direct assistance for capital expenditures is one method by which this obstacle may be overcome.

Table C presents emissions data for the five largest polluting plants in Canada's non-ferrous smelting sector. It also presents several scenarios regarding possible emissions in 1994 and the estimated capital costs associated with these lower

Table C

Smelter Emissions, Abatement and Capital Costs

emissions. These five plants emitted a total of 1.9 million tonnes of SO_2 in 1980, 26% below their total allowable limits of 2.5 million tonnes of SO_2. The 1994 emissions are based on various reduction scenarios presented to the Sub-committee. Two scenarios are presented for INCO's Copper Cliff smelter: the first involves increased pyrrhotite rejection plus roast reduction smelting; the second involves modifications to the copper circuit in addition to increased pyrrhotite rejection and roast reduction smelting.

According to the evidence received by the Sub-committee, total SO_2 emissions from these five sources can be reduced from 1,861,000 tonnes per year to 863,000 tonnes per year at a total capital cost of $926 million (1983 dollars) or even lower to 652,000 tonnes per year with a total capital cost of $1,087 million (1983 dollars). These projected emissions correspond to a 54%-65% reduction in emissions over *actual* 1980 levels and a 66%-74% reduction over 1980 *legal limits*.

The Sub-committee believes that actual SO_2 emissions in 1980 should be used as the base in calculating emissions reductions for this sector and in determining financial assistance for abatement. Emissions in that year were 26% below allowable limits, only a small portion of this being due to the start of the recession and resulting production cutbacks. To quote the Canadian Coalition on Acid Rain, "These are real lakes with real fish. We should be taking about real emission reductions, not paper ones."

In order to facilitate the financing of capital costs for SO_2 abatement, the Sub-committee makes the following recommendations with respect to government assistance.

12 Recommendation

The Sub-committee recommends that the Federal Government provide assistance to the non-ferrous smelting industry through a system of one-time *taxable* grants for capital expenditures associated with SO_2 abatement.

13 Recommendation

The Sub-committee recommends that these funds be made available only for retrofitted operations which have reduced their emissions by December 31, 1994 or have commenced retrofit construction by that date.

14 Recommendation

The Sub-committee recommends that the following formula be used to allocate these grants:

1) **a basic grant of $350 for every tonne per year (tpy) of SO_2 reduction from actual 1980 emission levels;**
2) **an additional grant of $100 for every tonne per year of SO_2 reduction from actual 1980 levels in excess of a 50% reduction.**

These per unit grants are to be adjusted according to changes in the Gross National Expenditure Implicit Price Index for machinery and equipment in order to maintain the purchasing power of these grants.

15 Recommendation

The Sub-committee recommends that these funds be disbursed on a dollar-for-dollar basis as construction expenditures are undertaken. Disbursements are to be made on the basis of estimated SO_2 reductions from 100% of rated capacity utilization.

We recognize that the distribution of SO_2 abatement between smelting plants will likely be unequal, both in absolute and relative terms. As a consequence, any assistance package must take these different abatement rates into account. In addition, some plants might be ordered by a province to reduce their emissions by a very high percentage and for this reason we propose that an additional grant be made available for such circumstances.

Simply put, this formula will grant taxable assistance according to the following rules. A plant which is expected to emit 100 tonnes per year (tpy) of SO_2 in 1994 and which emitted 300 tonnes per year of SO_2 in 1980 will receive $350 x 200 tpy as a basic grant (totalling $70,000) plus an additional grant of $100 x 50 tpy (totalling $5,000). If actual emissions turn out to be, say, 150 tonnes per year in 1994 this plant must return $350 x 50 tpy of its basic grant ($17,500) and all of its additional grant of $5,000. If, however, the plant emits only 50 tonnes per year of SO_2 after 1994 because it is operating at 50% of capacity, no additional funds will be made available.

The Sub-committee has deliberately chosen to employ a system of taxable grants as opposed to non-taxable grants. The two can be made equal on an after-tax basis by taking into account the rate at which corporate income is taxed and increasing the level of taxable grants by an appropriate amount. In other words, a $200 taxable grant to a corporation which is taxed at a 50% rate is equal to a $100 non-taxable grant.

By increasing the level of assistance and making these grants taxable, smelting firms will be able to take early advantage of any tax benefits resulting from current losses. This will help to ensure that tax relief for corporate losses is not lost to these companies, will advance the provision of tax relief, and will provide vital cash flow to these companies as expenditures for abatement are made.

When construction of abatement facilities commences, some firms may be enjoying a healthy financial position while others are not. All firms will receive the abatement

grant; however, very profitable firms will return approximately one-half of these grants as tax payments in the same year while less profitable firms will, in effect, only pay the taxes associated with this grant in later years when profits improve.

This system of grants has been referred to as assistance for capital expenditures. By design, however, these are not capital grants. Assistance to firms bears no direct relation to actual expenditures; the relation is to actual emission reductions. The Sub-committee views these grants as an "up-front" assistance package designed to reduce the burden of all costs associated with SO_2 control; it just so happens that the largest costs are incurred early when the firms are least able to bear them. Since these grants are taxable, a reduction in, say, capital cost allowances by the amount of these grants would constitute an element of double taxation. This view of our recommended grant system leads us to make the following recommendation.

16 Recommendation

The Sub-committee recommends that qualifying expenditures for capital cost allowances and the investment tax credit not be reduced by amounts received under the SO_2 abatement grant system.

Under the scenarios outlined in Table C, this system of taxable grants will require outlays of $362 million ($349 million in basic grants and $13 million in additional grants) to achieve 54% abatement by 1994. To achieve 65% abatement, these grants will increase to $457 million, of which $423 million will constitute basic grants and $34 million will constitute additional grants. The actual cost of these grants to the Federal Government will, of course, be much less. The precise cost will depend on the profit performance of the grant-receiving companies over the relevant period. These grants amount to approximately 39% of capital costs for SO_2 abatement before taxes.

The system of grants recommended by the Sub-committee does not take into account the reductions in SO_2 emissions achieved by this sector in the 1970s. In some instances, these reductions have been very substantial (e.g. INCO and Falconbridge), while in others, reductions have been minor or non-existent. Since the costs of abatement rise with increased sulphur fixation, we would prefer a grant program to take this factor into account. The Sub-committee does not possess the necessary information to devise such a grant system. However, we do suggest that the Department of Environment consider revising our grant system to take into account past abatement efforts by smelters, wherever possible.

D. The Economics of Non-Ferrous Smelting and SO_2 Control

The features of the smelting sector, as discussed earlier, have prompted the Federal Government to undertake a major study of this industry, with the goal of devising options to revitalize the smelting industry and again make it competitive internationally[1]. The Department of Energy, Mines and Resources (EMR), the author of that study, concurs with the Department of Environment's stated objective of reducing SO_2 emissions in eastern Canada by 50% by 1994. In fact, the study was prepared under the assumption that this 50% goal can only be met if the smelting sector reduces emissions by 65%-70%.

The EMR study approaches the problem differently than does the Sub-committee. Our goal is to devise a strategy for reducing acid rain-causing emissions while maintaining, and enhancing where possible, the viability of the smelting sector. This can be thought of as an abatement-viability strategy. The EMR approach can be thought of as a rationalization-abatement strategy; that is, the restructuring of the industry is the primary goal while a 65%-70% abatement in SO_2 emissions is the constraint under which this goal must be achieved. Both strategies should achieve the same results in the long run.

The cost of SO_2 control is determined by many factors. The one on which the EMR study concentrates is the choice of technology. Many abatement technologies currently exist. However, they are for the most part methods by which SO_2 gases are captured, with little thought given to their effects on production efficiency. In other words, these are pollution-control technologies, not smelting technologies; they pay little attention, for example, to the economics of smelting or by-product marketing.

The approach of the EMR study is to seek technologies which improve labour and energy efficiency, which may enhance metals recovery and which produce by-products having a positive net value to the firm. An important aspect is the understanding that SO_2 emissions *must be reduced significantly* from current levels. The Department's study, then, is concerned primarily with production processes

[1] Energy, Mines and Resources Canada, *Canada's Nonferrous Metals Industry: Nickel and Copper, A Special Report*, Ottawa, May 1984.

and not add-on abatement technologies. In this approach, firms will eventually undertake the required capital expenditures because it is in their best interests to do so.

The EMR strategy has the potential for cost-effective SO_2 abatement, and by a much greater proportion than does the use of existing add-on technology. The penalty to smelting firms, and to governments which provide financial assistance for abatement, is thus reduced. It is expected that the development of this new technology will take two to three years of concerted research effort on the part of firms involved before these new processes can be employed on a commercial level. By that time, it is hoped, the financial position of the smelting operations will be better able to support the major capital expenditures required.

The EMR approach does, however, add a certain element of risk to the SO_2 abatement strategy. It is only after an intensive research effort that it will be known if these processes will work and if they will be viable.

Moreover, if the EMR strategy delays the start of significant SO_2 curtailment, the advantages of reducing abatement costs may be outweighed by the additional environmental damage caused by this delay.

Furthermore, the choice of a strategy for the abatement of SO_2 in the smelting industry (i.e. the rationalization-abatement approach vs. the abatement-viability approach) depends very much on the time constraints involved. According to EMR, new technologies can be developed if the target date for SO_2 curtailment is 1994 or later. An earlier target date effectively eliminates the EMR strategy from consideration, requiring that existing add-on technologies be used.

With respect to the choice of target dates, it should be pointed out that 1994 is the date specified by the recent agreement to reduce emissions by 50% which was signed by the federal Minister of the Environment and his provincial counterparts.

Current technology for SO_2 abatement from smelters relies very heavily on the production of sulphuric acid from captured gases. This poses numerous problems for eastern Canadian smelters, primarily because of their location; the demand for sulphuric acid is located far from most smelters and the attendant high rail transportation costs make it almost impossible for these plants to earn any positive return. Although some possibility exists for the creation of acid demand in Ontario for the production of fertilizer, the bulk of the market for acid is expected to remain in the United States.

Abatement through acid production could add 1.5 million tonnes per year to Canadian sulphuric acid production. The demand for such additional supplies does not exist at current prices or in locations near Canadian smelters. This additional production must be sold at distress prices with the smelters bearing very high transport costs to supply distant markets.

It is primarily for this reason that current technology is inconsistent with the rationalization-abatement strategy in general. In those instances where smelters are already employing relatively modern technology, there are few efficiency gains to be had from new smelting processes and thus acid production is the only practical solution. In other instances, however, new production processes can increase productive efficiency, achieve SO_2 curtailment and produce a more marketable by-product such as elemental sulphur.

By employing the rationalization-abatement strategy towards the smelter industry, the market in effect becomes the prime determinant of any government assistance and the impact of any such assistance tends to be neutral with respect to the firms concerned. Put simply, the demand for the various metal products and the supply of those products in the rest of the world will determine the output levels of Canadian smelters and ultimately determine which ones will survive. Consistent with this strategy, then, is the principle that assistance will go only to those plants which have a chance of surviving world competition.

The Sub-committee welcomes the release of this study and agrees with its general thrust. *We note, however, that the difficulties associated with the development and deployment of new technologies do make the EMR strategy a potentially risky one from an environmental standpoint.*

E. Concluding Comments

To sum up, a program of SO_2 abatement which reduces emissions from Canada's five largest sulphur dioxide-emitting non-ferrous smelters by one-half to two-thirds of 1980 actual emissions will require capital expenditures in the range of $900 milion to $1,100 million. (These figures are expressed in constant 1983 dollars.) Such an abatement program will, undoubtedly, also impose additional costs on some of these plants. These operating costs are, however, much more nebulous. The annual operating penalty in many instances relates to the negative net-backs which companies are to receive from sulphuric acid sales. Although we have received testimony in this regard, the uncertainty concerning future acid prices and market demand dissuades the Sub-committee from making estimates of this type. Thus we have concentrated on capital costs.

The notion that these operations should receive some financial assistance is one borne out of practicality, equity and the belief that the acid rain problem should be resolved without delay. Our contact with Canadians through public hearings and private meetings has indicated that broad support exists for such a proposal. A recent Gallup Poll indicates that 65% of Ontarians approve the use of public funds to aid in reducing INCO's emissions. Thus the Sub-committee feels confident to recommend this approach.

The most important element in this assistance package is a system of taxable abatement grants for the non-ferrous smelting sector. We envisage total outlays for these grants to be in the neighbourhood of $362 million to $457 million, approximately 40% of total capital expenditures. Much of these grants will be returned to the government in the form of future tax payments, so that the after-tax contribution will be closer to 20% of capital costs.

The Sub-committee also feels that the tax system can play an important role in the promotion of SO_2 control and in assisting this abatement effort. We have discussed at length the importance of scientific research and this report recommends changes in the tax treatment of research expenditures which recognize the value of this endeavour. We have also made recommendations concerning the tax treatment of pollution control capital. We estimate that the real value of capital cost allowances to corporations can be increased by over 20% if our recommendations are adopted and that the cash flow to this sector can be increased by more than $100 million in the first two years of an abatement program.

The Sub-committee feels that these recommendations provide the basis for a rational program to curtail acid rain-causing emissions. We believe this assistance package to be realistic and counters any arguments put forward by the industry that SO_2 control is too expensive for the firms involved or that such control should be delayed. The vital task of cleaning up the environment can now commence. The Wilderness Society of Newfoundland and Labrador stated, in a brief to the Sub-committee, that: "The above proposals will cost money, probably a lot of money.... Some programs will simply require the company, the consumer and the taxpayer to pay for the benefits of a clean, healthy environment.... We will have to start paying for the quality of the air we breathe, the water we drink and the land we live on." The Sub-committee is in full agreement with the logic of this statement.

CANADA/USA RELATIONS

The essentially bilateral nature of the North American acid rain problem has occupied a substantial part of the Sub-committee's time and energy since we first received our Order of Reference in July 1980. A major reason for reconvening the Sub-committee in March 1983 was the obvious breakdown in negotiations toward an air quality agreement between Canada and the United States. This observation was coupled with the fact that Canada was in great danger of forfeiting any political initiative on the bilateral question because of a lack of progress in the control of domestic SO_2 and NO_x emissions.

At least 50% of Canada's acid rain — and as much as 70% in some areas — has its origin in the emissions of SO_2 and NO_x from heavily-industrialized regions of the United States. Canada's contribution to the American acid rain problem is much smaller, accounting for about 10% to 15% of the total. Thus, while there is a movement of air-borne pollution across the international boundary in both directions, there is an obvious imbalance of national contributions and Canada clearly is the aggrieved party.

It is probable also that Canada is suffering greater damage from acid rain than is the United States. Large areas of eastern Canada, particularly, are geologically vulnerable to acidic pollution. The litany of damage, in Ontario especially, has become depressingly familiar: 4,600 lakes with acid levels too high to support fish life and 12,000 more moving inexorably toward fatal acidification, out of a total of 48,000 lakes classified as susceptible. If anything, Quebec is even more sensitive to acidification than is Ontario. Farther east, Nova Scotia's valuable Atlantic salmon resource has been savaged by acid rain and environmental scientists in Newfoundland are fearful of a like fate for that province.

Many Americans have, over the past several years, become acutely aware that acid rain is causing severe damage in parts of the United States. In 26 states east of the Mississippi River, studies have shown that 18% of the lakes have been damaged by acid rain. Thirteen of these states are geologically vulnerable to acid rain. The situation in the Adirondacks of upstate New York is well-known, with 180 lakes in resort areas now devoid of fish life.

Clearly, the attack on acid rain, if it is to be successful, must be a joint Canada-United States effort. Unfortunately, the political will needed to tackle the problem is lacking in the United States.

The Sub-committee has received a large volume of testimony on the bilateral aspects of the acid rain problem. It is instructive to review briefly the history of this issue since pertinent conclusions can then be drawn which may serve as guidelines in future negotiations with the United States.

The long-range transport of air pollution has been a priority issue at Environment Canada since 1976. Acid rain has been regarded as an important environmental problem at least since June 1977 when the then Minister of Environment Canada, the Honourable Romeo LeBlanc, described it as "an environmental time bomb". The first attempt at a cooperative approach to the issue by the governments of Canada and the United States occurred in 1978 with the formation of the Bilateral Research Consultation Group (BRCG) on the Long-Range Transport of Air Pollutants (LRTAP). The BRCG first met in July 1978; it produced a study of the issue, "The LRTAP Problem in North America: A Preliminary Overview", in October 1979.

It is interesting to recall that, in 1978, there was considerable enthusiasm inside the United States for the development of a formal agreement on air quality with the Canadian Government. Indeed, in the fall of 1978, the U.S. Congress passed a resolution, later incorporated as an amendment to the U.S. *Foreign Relations Authorization Act*, requiring the American State Department to negotiate an air quality agreement with Canada. This initiative arose from two Canadian fossil-fuelled electric power projects; Saskatchewan Power Corporation's East Poplar River plant and Ontario Hydro's Atikokan power plant. Environmentalists in the United States feared that emissions from these plants would degrade air quality in the border states of Montana and Minnesota, respectively.

In July 1979, the Canadian and United States Governments issued a Joint Statement on Transboundary Air Quality which emphasized both LRTAP and acid rain. In August 1980, the Memorandum of Intent was signed; negotiations between the two governments to achieve a transboundary air pollution control agreement began on 23 June 1981 in Washington, D.C.

Between the signing of the Memorandum of Intent in 1980 and the start of formal bilateral negotiations in 1981, the Reagan Administration took office in Washington. This determinedly anti-environmentalist administration clearly was not seriously interested in an air quality agreement with Canada if it entailed expensive pollution control measures for United States industry. By the summer of 1982, the formal negotiations between Canada and the United States had collapsed.

The members of the Sub-committee viewed these developments with a sense of growing alarm. While we believed then, as now, that the only practical solution to the acid rain problem must be based on a continental pollution control strategy, we now felt that the only useful approach to make to our American neighbours would have to be political, inasmuch as the diplomatic

initiative had foundered on the intransigence of the Reagan Administration.

A political approach to a problem as complex as acid rain is bound to be difficult. The first principle to be adhered to, in the Sub-committee's opinion, is that of arguing one's case from a position of strength. One cannot go to the United States and demand that costly pollution controls be implemented when Canada's record is obviously deficient in a number of important areas.

The Sub-committee recommended in 1981, for example, that Ontario Hydro use the best available technology on its coal-fired power plants to reduce SO_2 and NO_x emissions. This recommendation was based on the fact that U.S. power stations had installed approximately 100 scrubbers while Canada had none. The recommendation was not adopted. In January 1981, Ontario Hydro had announced a planned reduction of total SO_2 and NO_x by more than 40% by 1990. Part of this reduction was to be achieved through the installation of limestone-slurry flue-gas desulphurization units (scrubbers), either at the Lambton plant or at Nanticoke; these plants are the largest coal-fired generators operated by Ontario Hydro.

This would have been the first use of scrubbers in Canada and the announcement generated positive political reaction in the United States. When Ontario Hydro later cancelled the plan to install scrubbers, the political effect was strongly negative. Moreover, a propaganda campaign was underway in the United States to the effect that Canada wanted expensive controls on the U.S. coal-fired electricity sector in order to create markets for excess Canadian hydroelectric power.

Although these claims were spurious, the approval in April 1982, by the National Energy Board, of Ontario Hydro's proposal to sell electricity from the Nanticoke plant to General Public Utilities (GPU) of New Jersey appeared to give credibility to the propaganda. The Nanticoke plant has no scrubbers. Environmentalists on both sides of the border were outraged. Those Americans who were opposed to a Canada-U.S.A. air quality agreement were delighted.

The Federal Government contributed to the controversy by not rendering a decision on the National Energy Board approval of the GPU contract. There were repeated questions in the House of Commons, and the presentation of a petition signed by 139 Members of Parliament and Senators that the power sale be tied to the installation of emission control devices. Finally, on 11 June 1982, the GPU cancelled the contract for internal financial reasons.

In the opinion of this Sub-committee, the net political effect of this incident was strongly negative and damaged Canada's credibility in the continuing debate with the Americans.

There have been other problems related to Canadian policy. Canada's motor vehicle NO_x emission standards are much less stringent than those in the United States. The political liability created by this issue is immense. It is particularly galling because this is undoubtedly the easiest issue for Canada to deal with; the technology is available and proven and most of the motor vehicles built in Canada use the technology; unfortunately, these vehicles are exported to the United States.

The Canadian non-ferrous smelting industry continues to be a problem in spite of the impressive progress at the Falconbridge and INCO smelters in Sudbury. Since 1960, SO_2 emissions from the Falconbridge smelter have been reduced by about two-thirds; INCO's emissions have been cut by a similar proportion since 1970. These achievements have not been effectively explained to the Americans who continue to use the INCO "superstack" as an enduring symbol of Canada's lack of resolve in tackling domestic SO_2 emissions. The absence of substantial controls on the INCO smelter in Thompson, Manitoba and the Hudson Bay Mining and Smelting Company Limited operation at Flin Flon, and especially the uncontrolled output of emissions from the Horne smelter at Rouyn-Noranda, continue to plague our efforts in the political battle south of the border.

Canada's proposal to effect a 50% reduction in SO_2 emissions east of the Saskatchewan/Manitoba border by 1990, contingent on parallel action in the United States, was rejected by Washington. Canada's stated intention to reduce domestic SO_2 emissions unilaterally by 25% appeared to have little positive effect. This initiative, announced on 15 February 1982, was not immediately accompanied by any information on where the emissions would be reduced. The Sub-committee believes that a proposal of this type, utterly lacking in specifics on where and how reductions will be made or how they will be financed, did not impress our critics in the United States or, indeed, in Canada.

When details of the cuts were made public on 22 December 1983, they raised more eyebrows than expectations. Approximately 20% of the total emission reductions, 221,000 metric tonnes, was to come from Noranda's Horne smelter at Rouyn-Noranda. Yet, Noranda had agreed to make no such cut and the Quebec Government had issued no control order to the company.

An additional 270,000 metric tonnes of SO_2 were to be eliminated through reductions "in non-utility fuel use emissions...as a result of gas conversions and reductions in heavy oil use" under the National Energy Program (NEP). Even if this goal were to be achieved by 1990 — and that is not a certainty — there is the suspicion that the Federal Government is not really effecting a 25%

reduction in acid rain-causing emissions, but is manipulating statistics to give the appearance of action.

The Sub-committee has argued for some time that Canada should adopt a vigorous program of emission reductions independently of the United States. It would, of course, be preferable if the Americans would join us in a cooperative program. This, however, is not presently possible and will in all probability not happen as long as the Reagan Administration remains in power in Washington.

The Sub-committee received testimony arguing that Canada should not adopt unilaterally a program of emission reductions. The substance of the argument rests on two premises. First, a 50% reduction in domestic SO_2 emissions will not result in a significant reduction in the sulphate deposition rate in sensitive areas. Therefore, there will not be a major reduction in the acid rain problem. The second premise holds that Canada should have something to offer the Americans if and when they decide to negotiate in good faith on mutual reductions in SO_2 emissions. If Canada acts unilaterally to reduce SO_2 emissions and later enters into negotiations with the United States, the argument goes, we will in effect be asking them to reduce their emissions unilaterally.

The Sub-committee does not accept these premises. We believe that the United States will act to reduce acid rain-causing emissions only when they decide it is in their own national interest to do so. If Canada contributed as much to U.S. acid rain as the United States does to ours, we could bargain with the Americans as equals. But Canada contributes only a small part of the acid rain falling on the United States so we have little to bargain with in the context of mutual emissions reductions.

While it is true that the most sensitive areas of Canada — such as the Muskoka-Haliburton area of Ontario — are heavily impacted by U.S.-sourced acid rain, the Sub-committee has frequently been told by Environment Canada officials, among others, that up to 50% of our problem comes from domestic pollution sources. That being the case, we fail to see how a unilateral 50% (or greater) reduction in domestic SO_2 emissions will not have a salutary effect on acid rain in particular, and on air pollution in general. If our domestic emissions are a part of the acid rain problem they should be reduced.

The inconsistency in the approach maintained by the Federal Government until very recently was cogently summarized by the Canadian Coalition on Acid Rain in testimony to the Sub-committee: "It is a peculiar logic in Canada to say to the United States that if they do not stop sending their pollution to us, we are just going to darn well continue to pollute ourselves."

The value in "going it alone", and reducing our emissions unilaterally, is both political and moral. If Canadians hope to convince the United States Government and federal legislators, in short the U.S. political system, that acid rain is an important environmental problem that must be resolved, we have to argue from a position of moral strength. The moral authority of our argument for emission controls in the United States will increase in direct proportion to the extent to which we reduce similar pollutants in Canada. The Sub-committee believes that the majority of American citizens and legislators have a strong sense of honour and fair play. They will understand and accept a moral argument. But if we in Canada appear to be asking the Americans to do something we are reluctant or unwilling to do ourselves, our argument will be quickly rejected.

The decision of the federal and provincial environment ministers on 6 March 1984 to achieve a unilateral 50% reduction in sulphur emissions by 1994 was welcome news for the Sub-committee and for all Canadians. As noted earlier, we have been advocating a significant unilateral clean-up effort in Canada since the publication of STILL WATERS in 1981.

Without denigrating this important policy breakthrough in any way, the Sub-committee feels that a number of points have to be made. First, the decision to reduce SO_2 emissions should not obscure the need — both practical and political — to curtail NO_x emissions from motor vehicles. Second, there must be real and substantive reductions at the major point sources of SO_2 in Canada. These include Noranda's Horne smelter, the HBMS smelter at Flin Flon, the INCO smelter at Thompson, the INCO operation at Sudbury, and the Algoma Steel sintering plant at Wawa.

There should also be significant reductions from Ontario Hydro, preferably at the large Nanticoke and/or Lambton generating stations. The SO_2 emissions from Ontario Hydro, as Canada's largest electrical utility company, are significant from the standpoint of environmental effects and as a political symbol. Although Ontario Hydro has been issued a control order by the Ontario Government mandating major acid gas emission reductions by 1990, the company's control program has been severely disrupted, if not thrown into disarray, by two major shutdowns at the Pickering nuclear station. On 30 April 1984, Ontario Environment Minister Andrew Brandt stated that Ontario Hydro will meet its commitment to reduce acid gas emissions even if it means that flue-gas scrubbers have to be employed. The Sub-committee welcomes this reassurance by the minister.

Finally, the Federal and Provincial Governments must move quickly and decisively to make public a specific SO_2 control strategy for

Canada. A significant delay could well result in a loss of the political momentum created by the original declaration. The March 6th announcement has fostered an almost tangible air of optimism and hope among Canadians that real progress may now be made in reducing domestic acid rain-causing emissions.

The Sub-committee strongly urges the Governments involved, Federal and Provincial, to act boldly and with dispatch to commence, at last, the long-awaited clean-up of acid rain in Canada. In so doing we will also establish, once and for all, an unqualified moral imperative that our American neighbours will be unable to ignore or counter in future political discussions and diplomatic negotiations.

APPENDICES

APPENDIX I

THE RESPONSE TO *STILL WATERS*

The Sub-committee's 1981 report on acid rain, STILL WATERS, presented 38 recommendations. Virtually all aspects of the issue were dealt with in one of more of those recommendations. In this section of our present report we evaluate the response of various governments to STILL WATERS.

RECOMMENDATION 1 — National Energy Program

The Sub-committee recommends that grants from the National Energy Program's Utility Off-Oil Fund for conversion of oil-fired electricity plants to coal be made conditional upon the installation of the best available emission control technology for oxides of sulphur and nitrogen.

RECOMMENDATION 2 — Coal-Fired Power Plants

The Sub-committee recommends that all conversions of oil-fired electricity plants to coal in Canada, whether or not such conversions are financed in whole or in part by government funds, be carried out utilizing the best available emission control technology for oxides of sulphur and nitrogen.

The Utility Off-Oil Fund of the National Energy Program (NEP) was created to assist in the conversion of oil-fired power plants to coal by financing up to 75% of the cost of *environmentally-acceptable* conversions. The descriptive, "environmentally acceptable", still has not been defined. However, Energy Mines and Resources Canada has set a target of a 50% SO_2 emission reduction and a requirement for NO_x and particulate matter reductions.

To date, there have been no conversions carried out under the NEP. Two power plants in New Brunswick and Nova Scotia are under consideration. The Coleson Cove generating station in Saint John has been the subject of a technical, economic and environmental study. The third and final phase of this study, involving engineering design and financing, is expected to be completed in December 1984. One technology being considered for Coleson Cove is the burning of a coal/water fuel mixture which is expected to reduce SO_2 emissions by about 50%.

The second power plant is the Point Tupper generating station in Nova Scotia. Here, a circulating fluidized bed combustion system is being studied. This technology will effect significant reductions in both SO_2 and NO_x emissions.

RECOMMENDATION 3 — Nova Scotia Power Corporation

The Sub-committee recommends that the Lingan Generating Station operated by the Nova Scotia Power Corporation at Cape Breton be compelled to utilize the best available emission control technology for oxides of sulphur and nitrogen. This recommendation applies to generating units presently in operation and to those units planned or under construction.

In making this recommendation, the Sub-committee was principally interested in the use of flue-gas scrubbers for SO_2 control. This technology has not been accepted and the high costs of installation and operation of these units are the reasons most often cited. The Nova Scotia Power Corporation is studying the use of indigenous low-sulphur coal and coal washing as cost-effective means of reducing SO_2 emissions from coal-fired power plants, including the Lingan operation in Cape Breton.

RECOMMENDATION 4 — Coal-Fired Power Plants

The Sub-committee recommends that all new coal-fired electricity plants planned or under construction in Canada be compelled to utilize the best available emission control technology for oxides of sulphur and nitrogen.

In April 1981 the Minister of Environment Canada issued "Thermal Power Generation Emissions - National Guidelines for New Stationary Sources". These guidelines indicated maximum quantities of nitrogen oxides (NO_x), particu-

late matter and sulphur dioxide (SO_2) to be emitted from "fossil fuel-fired steam-driven electricity generating units." The emission limits recommended in the guidelines are described as "achievable using control methods now available to the industry for the abatement of the specified air pollutants": in other words, by use of the best available technology. This technology is capable of reducing NO_x by 50%, particulate matter by 99%, and SO_2 by 90%.

Although the Minister of the Environment recommended that the provincial authorities adopt these guidelines, none has yet done so.

RECOMMENDATION 5 — Ontario Hydro

The Sub-Committee recommends that the Federal Government urge the Ontario Ministry of the Environment to compel Ontario Hydro to utilize the best available technology to control emissions of sulphur and nitrogen oxides at all existing and new coal-fired electrical generating stations in that province.

This recommendation has not been accepted. Ontario Hydro has not installed flue-gas scrubbers at any of its coal-fired stations to control SO_2 emissions. Ontario Hydro's control program is discussed in a separate chapter.

RECOMMENDATIONS 6 & 7 — INCO Limited

The Sub-committee recommends that the INCO Limited smelter at Copper Cliff, Ontario be compelled to reduce its sulphur dioxide emissions to 750 tonnes per day and that this level be attained within five years.

The Sub-committee recommends that the INCO Limited smelter at Thompson, Manitoba be compelled to reduce its sulphur dioxide emissions to 220 tonnes per day and that this level be attained within five years.

RECOMMENDATION 8 — Falconbridge Nickel Mines Limited

The Sub-committee recommends that the Falconbridge Nickel Mines Limited smelter at Sudbury, Ontario be compelled to reduce its sulphur dioxide emissions to 210 tonnes per day and that this level be attained within five years.

RECOMMENDATION 9 — Noranda Mines Limited (Mines Gaspé)

The Sub-committee recommends that the Noranda Mines Limited (Mines Gaspé) smelter at Murdochville, Quebec be compelled to reduce its sulphur dioxide emissions to 115 tonnes per day and that this level be attained within five years.

RECOMMENDATION 10 — Noranda Mines Limited (Horne Division); Hudson Bay Mining and Smelting Company Limited

The Sub-committee recommends that the Federal Government, in full consultation with concerned Provincial Governments and industry officials, convene a Task Force to study appropriate technologies and economic initiatives to implement an 80 per cent sulphur containment objective at the non-ferrous smelters operated by Noranda Mines Limited (Horne Division) at Noranda, Quebec and by Hudson Bay Mining and Smelting Company Limited at Flin Flon, Manitoba. The Task Force should be convened immediately and should report within a six-month period.

These recommendations have not been implemented. There has been considerable study and discussion of SO_2 emissions from these smelters and of strategies for their control since 1981. A Canada/Ontario Task Force released a report in late 1982 and identified five SO_2 abatement options for the two smelters in the Sudbury Basin (INCO and Falconbridge). The Manitoba Clean Environment Commission ordered INCO to submit plans on ways to reduce emissions at the Thompson smelter by 50% and 80% by the end of 1984; a similar order required Hudson Bay Mining and Smelting to submit plans for reducing SO_2 emissions by 50% to 400 tons (362.9 tonnes) per day. The Government of Quebec ordered Noranda to study the feasibility of reducing SO_2 emissions at the Horne smelter by 40%. None of these initiatives has resulted in any reduction in emissions from the smelting sector.

RECOMMENDATION 11 — Motor Vehicles

The Sub-Committee recommends that NO_x emission control standards for new motor vehicles sold in Canada be made at least as stringent as those enforced in the United States by the Environmental Protection Agency as of June 1981.

RECOMMENDATION 12 — Motor Vehicle Safety Act

The Sub-committee recommends that legislative authority to regulate motor vehicle emissions through standards applicable to manufacturers and distributors be transferred from the *Motor Vehicle Safety Act* to the *Clean Air Act* and hence from the Ministry of Transport to the Department of Environment which already has significant responsibilities in the area of air pollution.

Neither recommendation has been implemented.

RECOMMENDATION 13 — Forests

The Sub-committee recommends that Environment Canada continue an intensive research program into the effects that acid rain is having on Canadian forests. The Sub-committee further recommends that the Federal Government conduct a thorough review of the structure and funding of the Canadian Forestry Service to determine if there is a need for increases in funding and/or person years to effectively deal with the research requirements necessitated by the acid rain problem.

Environment Canada has informed the Sub-committee that, since 1980, "the Canadian Forestry Service (CFS) has appreciably expanded its Program in Acid Rain, working collaboratively with the provinces, with the forest industry, with the universities and with relevant specialists in other federal departments". The CFS is now allocating 21 person-years (PYs) to acid rain and air pollution studies, and current dollar resources run to about $1.3 million per year.

RECOMMENDATION 14 — Agriculture

The Sub-committee recommends that Agriculture Canada develop a comprehensive research program to study the effects of acid rain on crops and soils in Canada. This research program should include studies of the effects of acid rain precursors and ozone on crops and particular attention should be given to the effects that current fertilization practices are having on soils to render them more sensitive to cumulative acid loadings.

Agriculture Canada maintains a continuing program of research on soil acidity and on physico-chemical reactions in soil environments under acidic conditions. There is an extensive research program on the impacts of acid rain on soil aluminum and mineral plant nutrients. The department also proposes to develop a research program on the impact of acid rain and other atmospheric pollutants on plant growth and soil productivity.

RECOMMENDATION 15 — Liming

The Sub-committee recommends that liming, as a mitigative strategy against acid rain damage, be considered by governments only for selected waterbodies to raise the pH of the water to restore and/or protect desirable fish populations. The Sub-committee emphasizes that liming must not be regarded as a substitute for the control of acid rain-causing emissions at source.

No large-scale liming projects are being carried on in Canada. Environment Canada supports the use of liming only as a short-term mitigative measure. The department has research documentation indicating that liming can be effective in protecting freshwater fisheries. Environment Canada and other agencies are considering its use where valuable fisheries are endangered.

RECOMMENDATION 16 — Drinking Water

The Sub-committee recommends that the federal Department of Health and Welfare and the Department of Environment, in cooperation with provincial authorities, accord high priority to a research program to identify levels and species of toxic metals in potable water supplies in Canada with special emphasis being given to those areas under greatest impact from acid precipitation.

The Department of Health and Welfare has completed a study of the factors contributing to the contamination of drinking water as a result of acid deposition. A study has also been completed on an evaluation of water quality in "cottage country" where acidification of surface waters is taking place. The department has developed a methodology to assess surface water sensitivity to acid rain and this methodology is being applied to water supplies across Canada.

RECOMMENDATION 17 — Mercury in Fish

The Sub-committee recommends that the Federal Government examine its research program to ensure that adequate funding is being provided for research to determine the relationship between acidic precipitation and mercury contamination of fish in sensitive lakes and streams. We further recommend that suitable public health monitoring programs be initiated to determine the degree of risk faced by those populations whose diet contains large amounts of fish from sensitive areas.

The Department of Fisheries and Oceans (DFO) has initiated a number of projects which focus on the problem of metal contamination of aquatic organisms in acidic environments. Most of the work has been carried out in Western Canada by the DFO's Freshwater Institute in Winnipeg although some work has also been done in the James Bay area of Quebec. The department has initiated a National Inventory and Survey of Lakes and Rivers as part of its acid rain program. The results of this program, including mercury levels in a variety of fish species, are presently being analyzed.

RECOMMENDATION 18 — Monitoring

The Sub-committee recommends that Environment Canada, in consultation with appropriate provincial ministries, carry out a comprehensive review of all aspects of monitoring acidic precipitation in Canada. Of particular importance is the need for standardized methodology to permit ready comparasion of results obtained by the various monitoring systems operating in Canada.

Since 1981, acid rain monitoring programs of federal and provincial governments have been reviewed at several levels. A Federal-Provincial Research and Monitoring Coordinating Committee has been formed to ensure effective linkage between all provincial and federal programs. A federal-provincial subcommittee has been established to deal with quality control in precipitation and air sampling, sample handling, analysis and data management. Finally, the National Research Council sponsored a symposium in August-September 1982 on the monitoring and assessment of airborne pollutants with special emphasis on long-range transport and deposition of acidic materials. The symposium included a workshop on air and precipitation monitoring networks.

RECOMMENDATION 19 — Monitoring

The Sub-committee recommends that Environment Canada accelerate its efforts to make Canadian and United States precipitation chemistry monitoring systems compatible in terms of providing data of acceptable comparability.

Environment Canada and its counterpart agencies in the United States have accelerated efforts towards making precipitation-monitoring systems compatible through a number of actions. The Canadian Federal-Provincial Research and Monitoring Coordinating Committee has established formal contact with the U.S. National Acidic Precipitation Assessment Program to carry out cooperative studies and to ensure comptability of data sets. Canada and the United States maintain continuous joint studies on sampling and measurement protocols. Three intercomparison sites have been selected in each country where network samplers from both countries operate side by side; the collected samples are processed by both national agencies for intercomparison of final results. Canadian officials participate in U.S. program reviews, particularly in reviews of precipitation monitoring network operation and design and organization of collection sites.

RECOMMENDATION 20 — Monitoring

The Sub-committee recommends that the Federal Government provide appropriate funding for an effective research program to develop an accurate and reliable method for the monitoring of dry deposition.

The Federal Government has allocated significant resources in Environment Canada to address the dry deposition monitoring problem, particularly the development of appropriate instrumentation and methodologies. Over the past several years, Environment Canada has established an indirect experimental network for monitoring dry deposition. In 1986-87, Environment Canada will have established a routine operational network for estimating dry deposition.

RECOMMENDATION 21 — Alberta

The Sub-committee recommends that the Government of Alberta accord maximum priority to the control of acid rain-causing pollutants from industries in the province. The Sub-committee recommends that the Provincial Government adopt as its guiding policy a goal of zero increase in acid rain-causing emissions over present levels up to the year 2000, and an annual decrease by a prescribed amount each year thereafter.

The Alberta Ministry of Environment endorsed this recommendation when it was made and produced a report, "Alberta Sulphur Dioxide Forecast", which identified three strategies for SO_2 emission control. These strategies concentrated on thermal power plants, natural gas processing plants, and tar sands plants. At the time of publication of STILL WATERS, the Sub-committee's principal concern was over greatly increased SO_2 and NO_x emissions from the tar sands. Since these projected developments have not gone ahead as expected, the environmental threat has lessened temporarily.

The Energy Resources Conservation Board of Alberta (ERCB) has stated that this recommendation "is not practical or realistic" and cannot, therefore, be adopted by Alberta as a guiding policy for the future. The ERCB endorses the first part of the recommendation that the Alberta Government "accord maximum priority to the control of acid rain-causing pollutants". However, the second part is judged by the ERCB to be incompatible with expected growth in Alberta's population, natural gas production, coal-fired electric power generation, or increased exploitation of the tar sands.

RECOMMENDATION 22 — Clean Air Act

The Sub-committee recommends that the Federal Government develop comprehensive National Emission Guidelines (compulsory once adopted by a province) to cover all facilities, whether existing, converted, or new, which are sources of sulphur dioxide and nitrogen oxides, and hence of acid rain.

Environment Canada has informed the Sub-Committee that it has a program under which guidelines are established specifying levels of emissions which should be achieved by specific industries. The most recent guidelines were promulgated in April 1981 and concerned the thermal power generating industry. No additional guidelines have been developed in response to the above recommendation.

RECOMMENDATION 23 — Clean Air Act

The Sub-committee recommends that the *Clean Air Act* be amended to enable the Federal Government to develop National Emission Standards to cover sources of sulphur dioxide and nitrogen oxides resulting in interprovincial air pollution and acid rain.

Environment Canada has initiated a preliminary examination of this recommendation but no action has been taken to date.

RECOMMENDATION 24 — Clean Air Act

The Sub-committee recommends that where appropriate the Federal Government invoke ss. 20 and 21 of the *Clean Air Act* which allow the Minister of the Environment to recommend Specific Emission Standards to the Cabinet which would be applicable to works, undertakings or businesses in a particular industry or region within a province which has, by federal-provincial agreement, accepted National Ambient Air Quality Objectives.

Environment Canada has responded to this recommendation by informing the Sub-committee that the department is unable to act under ss. 20 and 21 of the *Clean Air Act* because no province has formally accepted the National Ambient Air Quality Objectives.

RECOMMENDATION 25 — Notice and Comment

The Sub-committee recommends that an appropriate uniform notice and comment procedure be provided for in the *Clean Air Act* and that it be applicable at the earliest possible moment in the development of National Ambient Air Quality Objectives, National Emission Standards, Specific Emission Standards and National Emission Guidelines.

The Environmental Protection Service of Environment Canada has responsibility for implementation of the *Clean Air Act* and has formulated an internal policy for public consultation based on the department's general guidelines. A "regulatory agenda" is now being published twice-yearly in the Canada Gazette. In addition, the department publishes *Environment Update*, a newsletter which is designed to keep the public informed on environmental issues and regulatory matters.

RECOMMENDATION 26 — Environmental Protection Legislation

The Sub-committee recommends that the following elements be included in environmental protection legislation to effectively reduce pollution in general, and particularly acid rain-causing air pollution:

1) The imposition of penalties high enough to ensure there is no benefit from saved costs of compliance in cases of non-compliance.
2) The creation of a tribunal which would have exclusive jurisdiction over environmental law prosecutions.
3) The creation of class action suits, private prosecutions and citizen civil suits.
4) The provision of a funding mechanism for class action suits which would otherwise not be instituted due to inadequate financial resources on the part of the initiators.

Environment Canada has stated that the department supports the intent of this recommendation. However, the department pointed out that the courts decide upon actual penalties based upon the nature of the offence and the maximum penalty permitted under the pertinent federal statute.

Environment Canada has responded to the second part of the recommendation by pointing out that the creation of a "tribunal" would require a basic change in the administration of criminal law. The administration of justice within a province is under the exclusive jurisdiction of the province and provincial agreement and action would be needed to create a tribunal.

The third part of the recommendation is under study by Environment Canada but, again, such civil law matters are under the exclusive constitutional jurisdiction of the provinces.

RECOMMENDATION 27 — Environmental Protection Legislation

Pending consideration and implementation of the reforms advocated in the previous recommendation, the Sub-committee recommends that effective steps be taken to apply existing environmental protection legislation, particularly as it relates to acid rain-causing air emissions. Among the steps that should be immediately taken by governments and the courts are:

1) The provision of additional legal and technical staff to environment departments.
2) The acceleration of court proceedings.
3) The harmonization of federal and provincial enforcement of environmental protection legislation.

Environment Canada has responded to parts (1) and (2) of this recommendation as follows:

1) The department supports the intent of this recommendation but states that provision of legal staff to environment departments is the responsibility of the Department of Justice who would support such additions if the need could be demonstrated.
2) The acceleration of court proceedings is a matter to be addressed by the courts.

RECOMMENDATION 28 — Regulatory Alternatives

The Sub-committee recommends that governments consider innovative acid rain control regulatory alternatives which have been tried with some success in other countries - for example, the Bubble Concept, Emission Offsets and Credits, etc. The Sub-committee further recommends that such regulatory alternatives should not be adopted where their effect would be to allow an overall increase in air emissions above the desired levels.

There has been no formal adoption by governments to date of such regulatory procedures as the "Bubble Concept" and "Emission Offsets and Credits". However, the apportionment of SO_2 emissions reductions to meet the unilateral 50% cut east of the Manitoba/Saskatchewan border by 1994 will, in effect, be approached by considering Eastern Canada as being under a regulatory "bubble". Environment Canada expects that, ultimately, the individual provinces will also establish bubbles to effect their emissions reduction strategies.

Eventually, each province will have to establish a "residual emission level" in perpetuity; that is, a constant level of emissions that will not be permitted to increase, even when new sources of pollution come into operation. To maintain the residual emission level, the provinces will have to adopt a strategy similar to, if not identical with, an Emission Offsets and Credits program.

RECOMMENDATION 29 — Access to Information

The Sub-committee recommends that appropriate legislative provision be made to permit public access to all records and data pertaining to the discharge of contaminants into the Canadian environment.

Environmental information of many types, including the discharge of contaminants, is available on request to a Canadian citizen or permanent resident under the provisions of the new *Access to Information Act*.

RECOMMENDATION 30 — Canada - U.S.A. Agreement

The Sub-committee recommends that Canada and the United States reach an agreement on the necessary legislation and mechanisms to substantially reduce transboundary air pollution, particularly as it relates to acid rain, by the end of 1982.

No agreement has been reached with the United States and negotiations have in effect ceased.

RECOMMENDATION 31 — U.S. Emissions

The Sub-committee recommends that governments, public interest groups, and individual Canadians in general explore and utilize all possible political, legal, administrative and media channels to ensure that acid rain-causing emissions originating in the United States are substantially reduced and that a Canada-U.S. agreement on the long-range transportation of air pollutants is signed by the end of 1982.

Acid rain-causing emissions originating in the United States have not been reduced. However, the issue of acid rain has evolved into one of significant domestic concern in the United States and public interest in the issue has increased greatly since 1981.

RECOMMENDATION 32 — International Parliamentary Associations

The Sub-committee recommends that the acid rain problem and its trans-boundary implications be publicized and discussed at appropriate meetings of International Parliamentary Associations attended by Canadian legislators. Of particular importance are the annual meetings of the Canada-United States Interparliamentary Group.

The issue of acid rain has been discussed by a number of international parliamentary associations since 1981, and particularly by the Canada-United States Interparliamentary Group. Environment Canada has actively assisted information transfer in this area and has provided briefing material for all recent meetings of the Canada-United States Interparliamentary Group.

RECOMMENDATIONS 33 and 34 — Public Awareness

The Sub-committee recommends that Environment Canada, in cooperation with appropriate provincial authorities, continue and expand its public awareness and information program on acid rain to alert and educate the Canadian public, particularly in those provinces and regions of Canada where the issue has not yet attained sufficient prominence.

The Sub-committee recommends that a major public awareness and information program is necessary to generate public conern in the United States about the acid rain problem and the threat it poses to the Canadian and American environments. The present program should be continued and expanded and consideration should be given to inviting influential American media representatives to Canada so they can be apprised of the transboundary effects of U.S.-sourced air pollution.

Since 1981, the public awareness programs of Environment Canada and other government agencies have increased greatly. For example, in 1981 Environment Canada had a budget of about $450,000 for public awareness-related activities; in 1983, this figure had increased to about $925,000. Public awareness of the acid rain issue in both Canada and the United States has increased significantly since 1981.

RECOMMENDATION 35 — Accelerated Capital Cost Allowance

The Sub-committee recommends that Accelerated Capital Cost Allowances continue to be granted for air pollution control devices and that these allowances be extended to new plants.

Accelerated Capital Cost Allowances (ACCA) were originally designed to provide assistance to firms required to retrofit their plants to curtail pollutant emissions. Environment Canada has undertaken a review of the ACCA to study their possible extension to new plants.

Shortly after the publication of STILL WATERS, the federal budget of November 1981 increased the write-off period to three years from two years for pollution-control equipment. This action reduced by one-half the amount of capital cost allowance which could be claimed in the first year; in effect, this action runs directly counter to the Sub-committee's recommendation.

RECOMMENDATION 36 — Polluter-Pay Principle

The Sub-committee recommends that the polluter-pay principle apply to the cost of installing abatement equipment in any future production facilities whose operations have the potential to emit oxides of sulphur or nitrogen.

Environment Canada has responded to this recommendation by stating that this principle is one of the bases for pollution control action in Canada; however, the polluter-pay principle may not be unequivocally appropriate in all situations.

RECOMMENDATION 37 — Sulphur By-Products

The Sub-committee recommends that the Federal Government, in co-operation with the Provincial Governments and the private sector, convene a Task Force on sulphur by-product utilization with the aim of developing a national marketing strategy for sulphur and sulphur products. Such a marketing strategy would involve finding new uses for sulphur products and may include the formation of a marketing board for sulphur and sulphur products.

The Task Force on sulphur by-product utilization was not convened nor has a marketing board for sulphur and sulphur products been formed. Environment Canada advised the Sub-committee that the Sulphur Development Institute of Canada (SUDIC), a tripartite organization with representation from the Federal and Provincial Governments and industry, is the principal organization working in this area. SUDIC's original mandate was to support research and development and marketing activities for by-product sulphur. More recently, SUDIC has expanded its role to include research into SO_2 emission control. SUDIC has developed a number of sulphur-based products including a paving material, a concrete formula, and a pre-moulded concrete block.

RECOMMENDATION 38 — Canadian Phosphate Deposits

The Sub-committee recommends that Canadian phosphate deposits be developed as a market for the sulphuric acid produced by control of sulphur dioxide in non-ferrous smelters.

Environment Canada stated that a study of the economic feasibility of developing the Cargill phosphate deposit in Ontario was undertaken by a consultant for the department. The study demonstrated, through a pilot project, that exploitation of the Cargill deposit could be commercially viable. However, no commercial development has been undertaken as yet.

APPENDIX II

LIST OF WITNESSES

Witnesses Who Appeared Before the Sub-committee at Public Hearings in Ottawa

Thursday 14 April 1983:

From the Government of Canada:

The Honourable John Roberts, Minister of Environment

Tuesday 19 April 1983

From the Canadian Coalition on Acid Rain:

Mr. Michael Perley, Executive Coordinator

From the Izaak Walton League of America:

Mr. Paul Hansen, Acid Rain Project Coordinator

Tuesday 26 April 1983:

From Environment Canada:

Dr. Hans Martin, Senior Manager, LRTAP Liaison Office

Tuesday 21 June 1983:

From the Government of Canada:

The Honourable John Roberts, Minister of Environment

From the "Société pour vaincre la pollution":

Mrs. Magali Marc, Co-Chairman

From Hudson Bay Mining and Smelting Co. Limited:

Mr. Keith Taylor, Senior Vice-president, Secretary and General Counsel

Mr. Wayne Fraser, Director, Safety and Environment

From STOP:

Mr. Bruce Walker, Director of Research

Mr. François Benoît, Animator

From the Centre for Foreign Policy Studies, Dalhousie University and the Canadian Institute of International Affairs:

Professor Don Munton

From the "Association québécoise de lutte contre les pluies acides":

Mrs. Danyelle Beaudry, Organizer

Mr. Pierre Vincent, Director

Wednesday 22 June 1983:

From INCO Limited:

Mr. Walter Curlook, Executive Vice-President

Mr. Charles Ferguson, Director of Environmental Affairs

From Friends of the Earth:

Mr. Ray Vles, Executive Director

Mr. Ralph Torrie, Energy Analyst

From Ontario Hydro:

Mr. Ian Wilson, Manager of Public Hearings

Mr. Ron Taborek, Coordinator, Acid Gas Program

Thursday 23 June 1983:

From the Canadian Coalition on Acid Rain:

Ms. Adele Hurley, Executive Coordinator

Mr. Michael Perley, Executive Coordinator

From Falconbridge Limited:

Mr. William James, Chairman of the Board, President and Chief Executive Officer

Mr. Frank Pickard, Vice-President, Metallurgy and Energy

From the Government of Manitoba:

The Honourable J. Cowan, Minister of Environment and Workplace Safety and Health

From Noranda Mines Limited:

Dr. Frank Frantisak, Director of Environment Services

From the Movement Against Acid Rain:

Mr. John Patterson, Co-Chairman

Mr. Jeff Shearer, Co-Founder

Wednesday 21 September 1983:

From the Government of Canada:

The Honourable Charles Caccia, Minister of Environment

From Environment Canada:

Mr. Alex Manson, Senior Manager, Priority Issues Directorate, LRTAP

Tuesday 6 March 1984:

From the Canadian Coalition on Acid Rain:

Ms. Adele Hurley, Executive Coordinator

Mr. Michael Perley, Executive Coordinator

Tuesday 1 May 1984:

From Fisheries and Oceans Canada:

Dr. John M. Cooley, Acid Rain Program Manager

Dr. D. Schindler, Freshwater Institute, Winnipeg

Mr. P.S. Chamut, Director General, Ontario Region

Mr. Dal Brodhead, Director General, Economic Development Directorate

Mr. Ray Z. Rivers, Senior Economist, Economic Research

Mr. Tom F. Wise, Manager, Economic Research

From the Montreal Urban Community:

Mr. Maurice Vanier, President, Environmental Commission and Member of the Executive Committee

Mr. Fernand Cadieux, Superintendent, Air Purification Department

From The United Church of Canada:

Mr. David Hallman, Secretary, National Working Group on Energy and the Environment

From Greenpeace:

Mr. Dan McDermott, Acid Rain Coordinator

Witnesses Who Appeared Before the Sub-committee at Regional Hearings Vancouver, British Columbia

Friday 28 October 1983:

From Suncor Inc.:

Mr. William L. Oliver, Vice-President, Administration, Resources Group

From the Society Promoting Environmental Conservation:

Ms. Jean Blundell, Education Coordinator

Ms. Cathy Fox, Executive Director

From Environment Canada:

Mr. A.N. Boydell, Regional Director General, Pacific and Yukon Region

Mr. Steve Nikleva, Chief, Scientific Services Division, Pacific Region

Mr. B.A. Heskin, Regional Director, Environmental Protection Service, Pacific Region

Mr. Ed Wituscheck, Manager, Air Programs, Environmental Protection Service, Pacific Region

From Fisheries and Oceans Canada:

Mr. S.C. Samis, Manager, Freshwater Project, Water Quality Unit, Habitat Management Division

Ms. Lorrie Pella, Consultant, Water Quality Unit, Habitat Management Division

From the Council of Forest Industries of British Columbia:

Mr. R.A. Shebbeare, Vice-President, Forests and Environment

Mr. Phil G. Gilbert, Manager, Environment and Land Use

Mr. R.R. Affleck, Vice-President, Environment, Canadian Forest Products Ltd.

From the Ministry of Environment of British Columbia:

Mr. R.G. Wilson, Assistant Director, Waste Management Branch

From ISCA Management Ltd.:

Mr. Douglas Caldwell

From Okanagan College:

Ms. Constance Harris, Biology Department

Mr. John Gordy, Richmond, B.C., Private Citizen

From the Green Party of British Columbia:

Mr. Paul George, Treasurer

Regina, Saskatchewan

Friday 25 November 1983:

From the Ministry of Environment of Saskatchewan:

Mr. Larry Lechner, Director, Air Pollution Control Branch

From the Saskatchewan Natural History Society:

Mr. Dale Hjertaas, Vice-President

From the Energy Resources Conservation Board of Alberta:

Mr. Vernon Millard, President

Mr. Victor E. Bohme, Board Member

Mr. Harry J. Webber, Manager, Gas Department

From the Saskatchewan Research Council:

Dr. Stanley R. Shewchuk, Senior Research Scientist

Toronto, Ontario

Wednesday 7 March 1984:

From the Canadian Coalition on Acid Rain:

Ms. Adele Hurley, Executive Coordinator

Mr. Michael Perley, Executive Coordinator

From the Liberal Party of Ontario:

Mr. Murray Elston, M.P.P. (Huron-Bruce), Environment Critic

From the Canadian Environmental Law Research Foundation:

Mr. Doug Macdonald, Executive Director

Ms. Marcia Valiante, Director of Research

From the New Democratic Party of Ontario:

Mr. Brian Charlton, M.P.P. (Hamilton-Mountain), Environment Critic

Thursday 8 March 1984:

From Environment Canada:

Dr. Robert Slater, Assistant Deputy Minister, Environmental Protection Service

Mr. V. Shantora, Chief Transportation Systems Division, Industrial Programs Branch, Environmental Protection Service

From the Motor Vehicle Manufacturers' Association:

Mr. Norman A. Clark, Vice-President

Mr. Richard L. Klimisch, Executive Director, Environmental Activities Staff, General Motors Corporation

Mr. W.A. (Bill) Green, Director, Environmental Activities, Engineering Department, General Motors of Canada, Limited.

Mr. R.M. Bright, Director, Environmental Control and Vehicle Safety, Ford Motor Company of Canada, Limited

Mr. J.W. Shiller, Principal Research Engineer Associate, Emissions Control Planning, Environmental and Safety Engineering Staff, Ford Motor Company, Limited

From the United Auto Workers Union in Canada:

Mr. Jim Gill, Director, Citizenship and Legislative Department for Canada

Mr. Michael P. Walsh, Arlington, Virginia, U.S.A., Consultant on Motor Vehicle Pollution Control

From Health and Welfare Canada:

Mr. John R. Hickman, Director, Bureau of Chemical Hazards, Environmental Health Directorate

From Noranda Mines Limited:

Mr. Michel Bédard, Chief of Laboratories

From the Federation of Ontario Cottagers' Association Inc.:

Ms. Rejeanne S. Anthon, Chairman, Environment Committee

Mr. Hamish Wilson, Toronto, Ontario, Private Citizen

From the Movement Against Acid Rain:

Mr. Peter F. Love, Vice-President

From the Muskoka Lakes Association:

Mr. Peter P. Armstrong, Chairman, Environmental Protection

Québec, Québec

Friday 16 March 1984:

From Noranda Mines Limited:

Dr. Frank Frantisak, Director of Environmental Services

Mr. Peter Fowler, Vice-President, Operations, Horne Division

Mr. Guy Pelletier, Director of Environmental Services, Horne Division

From the "Société pour vaincre la pollution":

Mrs. Magali Marc, Co-Chairman

From the Liberal Party of Quebec:

Mrs. Lise Bacon, M.P.P. for Chomedey, Spokesperson, Official Opposition, Environment Critic

From the "Fédération des associations pour la protection de l'environnement des lacs":

Mrs. Hélène-Louise Elie, President

Mr. André Nault, Technical Committee

From Grand Council of the Crees (of Québec) - Cree Regional Authority:

Mr. Allan F. Penn, Project Manager, Environment and Lands

Mr. Michel Jurdant, Professor, Department of Geography, Laval University

From Fisheries and Oceans Canada:

Mr. Yvan Vigneault, Head, Fish Management Branch

Mr. Claude Langlois, Project Director, Acid Rain

From "Association québécoise de lutte contre les pluies acides":

Mr. Pierre Vincent, Vice-President

From Atikamekw Sipi:

Mr. Ernest Ottawa, Spokesman, Atikamekw Chiefs;

Mr. Pierre Nadon, Executive Director

From "Association des biologistes du Québec":

Mr. Pierre Bilodeau, Responsible for "comité sur les précipitations acides".

St. John's, Newfoundland

Friday 13 April 1984:

From the Government of Newfoundland and Labrador:

The Honourable Hal Andrews, Minister of Environment

From the Ministry of Environment of Newfoundland and Labrador:

Mr. Alistair Kinsman, Deputy Minister

Mr. Les Hulett, Director of Industrial Environmental Engineering

From Fisheries and Oceans Canada:

Mr. David A. Scruton, Research Biologist, Newfoundland Region

Mr. Wesley J. White, Biologist, Fisheries Management, Research Branch

From Environment Canada:

Mr. Brian Power, Manager of Air and Water, Environmental Protection Service, Newfoundland District Office

Mr. Surin S. Sidhu, Research Scientist, Special Project, Newfoundland Forest Research Centre, Canadian Forestry Service

Mr. John Bursey, Scientific Services Meteorologist, Atmospheric Environment Service, Atlantic Region, LRTAP Program

From the Salmon Association of Eastern Newfoundland:

Mr. Richard Whitaker, Director

From the Wilderness Society of Newfoundland and Labrador:

Mr. David A. Snow, Executive Member

From the Newfoundland and Labrador Wildlife Federation:

Mr. Rick Bouzan, President

Smelters Visited by the Sub-committee

Sudbury, Ontario

Thursday 5 May 1983:

From INCO Limited:

Mr. Walter Curlook, Executive Vice-President

Flin Flon, Manitoba

Wednesday 8 February 1984:

From Hudson Bay Mining and Smelting Co. Limited:

Mr. Keith Taylor, President and Chief Executive Officer

Thompson, Manitoba

Thursday 9 February 1984

From INCO Limited:

Mr. Bill Clement, President, Manitoba Division

Organizations and Individuals Who Briefed the Sub-committee

Washington, D.C.

27-29 June 1983:

From the United States House of Representatives:

Mr. Tim Wirth, Representative
Mr. Gerry Sikorski, Representative

Mr. John Dingell, Representative
Mr. James H. Scheuer, Representative
Mr. Edward Madigan, Representative

From the Environmental Protection Agency:

Mr. Fitzhugh Green, Deputy Assistant Administrator

From the Tennessee Valley Authority:

Mr. S. David Freeman, Director

Flin Flon, Manitoba

Wednesday 8 February 1984:

From the United Steelworkers of America, Local 7486:

Mr. Steve Hamon, President

Thompson, Manitoba

Thursday 9 February 1984:

From the United Steelworkers of America, Local 6166:

Mr. Morgan Svenson, President

Winnipeg, Manitoba

Friday 10 February 1984:

From the Ministry of Environment and Workplace Safety and Health:

Mr. Gérard Lécuyer, Minister

Knoxville, Tennessee

9-10 May 1984:

From the Tennessee Valley Authority:

Mr. Richard Freeman, Director
Mr. Charles H. Dean, Chairman, Board of Directors

Individuals and Organizations Who Submitted Briefs and Letters to the Sub-committee, But Who Did Not Appear as Witnesses

The Algoma Steel Corporation, Limited
Sault Ste. Marie, Ontario

Luc Beason
Sidney, British Columbia

L. Denis Brown
Regina, Saskatchewan

The Canadian Chamber of Commerce
Ottawa, Ontario

Canadian Institute of Public Health Inspectors
Maple Ridge, British Columbia

The Canadian Medical Association
Ottawa, Ontario

"Comité permanent sur l'environnement à Rouyn-Noranda"
Rouyn, Québec

Thomas J. Crowley
Okanagan College
Salmon Arm, British Columbia

Eric Cunningham, M.P.P.
Wentworth North
Ontario Legislative Assembly

École du Vieux Verger
Grade 6 (Students)
Aylmer, Québec

Eastman & Associates Management Limited
Delta, British Columbia

Energy Probe
Toronto, Ontario

Energy Probe of Ottawa-Carleton
Ottawa, Ontario

Environmental Law Centre
Edmonton, Alberta

D. A. Fraser
Town of Mount Royal, Québec

Kenneth B. Gault
Weston, Ontario

David G. Gilmour
Vancouver, British Columbia

115 KV Group
Otterville, Ontario

Michel J.P. Leduc
Hull, Québec

Jackie Mactaggart
Plantagenet, Ontario

National Museum of Natural Sciences
Ichthyology Section
Ottawa, Ontario

Petroleum Association for Conservation of the Canadian Environment
Ottawa, Ontario

Powassan Horticultural Society
Air Pollution Committee
Powassan, Ontario

A. K. Ray
Gloucester, Ontario

Reid, Collins and Associates Limited
Vancouver, British Columbia

Rotary Club of Montréal
Montréal, Québec

Sierra Club of Western Canada
Victoria, British Columbia

Mach Stepp
Moose Jaw, Saskatchewan

John A. Sterling
Dorval, Québec

Sussex Regional High School
Physical Science Class 103
Sussex, New Brunswick

Temagami Lakes Association
Acid Rain Committee
North Bay, Ontario

Tourism Ontario Inc.
Toronto, Ontario

TRIUMF
Vancouver, British Columbia

"Union Québécoise pour la conservation de la nature"
Ste-Foy, Québec

Stanislaw Urbanik
Ottawa, Ontario

Van der Klaauw Family
Willowdale, Ontario

Waterloo Public Interest Research Group
University of Waterloo
Waterloo, Ontario

Watson Lake Trust
Willowdale, Ontario

Wildlands League
Toronto, Ontario

Kathy Zavitz
Weston, Ontario

APPENDIX III

ORDERS OF REFERENCE AND MINUTES OF PROCEEDINGS

ORDER OF REFERENCE

Wednesday, March 9, 1983

ORDERED, —

That the Standing Committee on Fisheries and Forestry be empowered to appoint nine Members of the House to act as a subcommittee to investigate, monitor and report on all aspects of acid rain;

That the subcommittee and members of the subcommittee have the power to adjourn and travel from place to place in Canada and the United States of America and that the necessary staff accompany the subcommittee and members of the subcommittee;

That the subcommittee have the power to retain the services of expert professional, technical and clerical staff as may be deemed necessary; and

That the subcommittee shall report to the Committee from time to time.

ATTEST

C. B. KOESTER

The Clerk of the House of Commons

ORDER OF REFERENCE

Thursday, March 10, 1983

ORDERED, —

That a Sub-committee of this Committee be established to investigate, monitor and report on all aspects of acid rain and to report to this Committee from time to time.

That the Sub-committee be made up of 5 members of the Liberal Party, 3 members of the Progressive Conservative Party and 1 member of the New Democratic Party chosen from the House to be appointed after consultations with the Whips of the various parties.

That in addition to the powers conferred upon it by the House, the Sub-committee be empowered to send for persons, papers and records, to sit while the House is sitting, to sit during the periods when the House stands adjourned to print from day to day such papers and evidence as may be ordered by it and to authorize the Chairman to hold meetings to receive and authorize the printing of evidence when a quorum is not present.

ATTEST

William C. Corbett

The Clerk of the Standing Committee
on Fisheries and Forestry

ORDER OF REFERENCE

Tuesday, December 13, 1983

ORDERED, —

That the Standing Committee on Fisheries and Forestry be empowered to appoint nine Members of the House to act as a subcommittee to investigate, monitor and report on all aspects of acid rain;

That the subcommittee and members of the subcommittee have the power to adjourn and travel from place to place in Canada and the United States of America and that the necessary staff accompany the subcommittee and members of the subcommittee;

That the subcommittee have the power to retain the services of expert professional, technical and clerical staff as may be deemed necessary;

That the subcommittee shall report to the Committee from time to time; and

That the evidence adduced by the subcommittee in the first session of the present Parliament be deemed to have been laid upon the Table and referred to the Committee.

ATTEST

C. B. KOESTER

The Clerk of the House of Commons

ORDER OF REFERENCE

ORDERED, —

Friday, December 16, 1983

That a Sub-committee of this Committee be established to investigate, monitor and report on all aspects of acid rain and to report to this Committee from time to time.

That the Sub-committee be made up of 5 members of the Liberal Party, 3 members of the Progressive Conservative Party and 1 member of the New Democratic Party chosen from the House to be appointed by the Chairman of this Committee after consultations with the Whips of the various parties. Any subsequent membership change will be made by the Chairman of the Sub-committee after the usual consultations with the Whips of the various parties.

That in addition to the powers conferred upon it by the House, the Sub-committee be empowered to send for persons, papers and records, to sit while the House is sitting, to sit during the periods when the House stands adjourned to print from day to day such papers and evidence as may be ordered by it and to authorize the Chairman to hold meetings to receive and authorize the printing of evidence when a quorum is not present.

ATTEST

William C. Corbett

The Clerk of the Standing Committee
on Fisheries and Forestry

ORDER OF REFERENCE

ORDERED, —

Tuesday, May 15, 1984

That, further to the order of this Committee of Friday, December 16, 1983, creating the Sub-committee on Acid Rain, this Committee authorize the said Sub-committee to undertake the printing of its report before presentation to this Committee.

ATTEST

William C. Corbett

The Clerk of the Standing Committee
on Fisheries and Forestry

[*Text*]

Issue No. 5

MINUTES OF PROCEEDINGS

THURSDAY, MAY 3, 1984
(14)

The Sub-committee on Acid Rain of the Standing Committee on Fisheries and Forestry met, *in camera*, at 3:45 o'clock p.m. this day, the Chairman, Mr. Ron Irwin, presiding.

Members of the Sub-committee present: Messrs. Blackburn and Irwin.

In attendance: *From the Library of Parliament, Research Branch*: Mr. Tom Curren, Research Coordinator, and Mr. Marion Wrobel, Researcher. *From Currie-Irving Advertising Ltd.*: Mr. Ed Hladkowicz, Account Executive.

The Sub-committee resumed consideration of its Order of Reference dated Friday, December 16, 1983, relating to acid rain. (*See Minutes of Proceedings and Evidence dated Tuesday, January 17, 1984, Issue No. 1*).

The Sub-committee began consideration of a draft report.

At 5:05 o'clock p.m., the Sub-committee adjourned to the call of the Chair.

TUESDAY, MAY 8, 1984
(15)

The Sub-committee on Acid Rain of the Standing Committee on Fisheries and Forestry met, *in camera*, at 9:46 o'clock a.m., this day, the Chairman, Mr. Ron Irwin, presiding.

Members of the Sub-committee present: Messrs. Blackburn, Corbett, Cyr, Darling, Gurbin, Irwin and Tousignant.

In attendance: *From the Library of Parliament, Research Branch*: Mr. Tom Curren, Research Coordinator, and Mr. Marion Wrobel, Researcher.

The Sub-committee resumed consideration of its Order of Reference dated Friday, December 16, 1983, relating to acid rain. (*See Minutes of Proceedings and Evidence dated Tuesday, January 17, 1984, Issue No. 1*).

The Sub-committee resumed consideration of a draft report.

On motion of Mr. Darling, it was agreed, - That the report of the Sub-committee, as amended, be adopted.

On motion of Mr. Cyr, it was agreed, - That the report be printed in separate English and French versions.

On motion of Mr. Blackburn, it was agreed,- That 20,000 copies of the English version and 5,000 copies of the French version of the report be printed.

On motion of Mr. Corbett, it was agreed, - That the report be printed by June 7, 1984.

At 10:43 o'clock a.m., the Sub-committee adjourned to the call of the Chair.

TUESDAY, MAY 15, 1984
(16)

The Sub-committee on Acid Rain of the Standing Committee on Fisheries and Forestry met, *in camera*, at 3:43 o'clock p.m., this day, the Chairman, Mr. Ron Irwin, presiding.

Members of the Sub-committee present: Messrs. Irwin and Tousignant.

In attendance: *From the Library of Parliament, Research Branch*: Mr. Tom Curren, Research Coordinator, and Mr. Marion Wrobel, Researcher. *From Currie-Irving Advertising Ltd.*: Mr. Ed Hladkowicz, Account Executive, and Mr. Random MacIvor, Art Director.

The Sub-committee resumed consideration of its Order of Reference dated Friday, December 16, 1983, relating to acid rain. (*See Minutes of Proceedings and Evidence dated Tuesday, January 17, 1984, Issue No. 1*).

The Sub-committee met to discuss the format and the design of its report.

At 4:21 o'clock p.m., the Sub-committee adjourned to the call of the Chair.

THURSDAY, MAY 24, 1984
(17)

The Sub-committee on Acid Rain of the Standing Committee on Fisheries and Forestry met, *in camera*, at 3:40 o'clock p.m., this day, the Chairman, Mr. Ron Irwin, presiding.

Members of the Sub-committee present: Messrs. Bossy, Darling, Irwin, Masters and Simmons.

In attendance: *From the Library of Parliament, Research Branch*: Mr. Marion Wrobel, Researcher.

The Sub-committee resumed consideration of its Order of Reference dated Friday, December 16, 1983, relating to acid rain. (*See Minutes of Proceedings and Evidence dated Tuesday, January 17, 1984, Issue No. 1*).

On motion of Mr. Darling, it was agreed,—That the Report of the Sub-committee adopted on Tuesday, May 8, 1984, be printed as Issue No. 5 of the Minutes of Proceedings and Evidence of the Sub-committee; and that all copies of the said Report have a distinctive cover as approved by the Sub-committee.

On motion of Mr. Darling, it was agreed,—That the Chairman present the First Report of the Sub-committee to the Standing Committee on Fisheries and Forestry.

On motion of Mr. Darling, it was agreed,—That the contract between Currie-Irving Advertising Ltd. and the House of Commons of Canada be increased by $400.00, and by an amount in excess of the total to cover the Federal Sales Tax.

At 4:07 o'clock p.m., the Sub-committee adjourned to the call of the Chair.

Jean Michel Roy,
Clerk of the Sub-committee